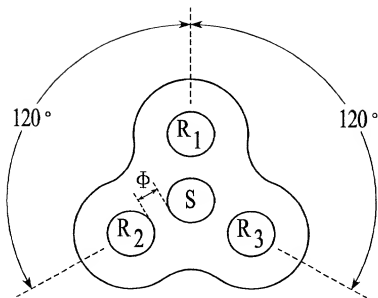


FIG. 1



R - LIGHT RECEIVER FIBER OPTICS  
S - LIGHT SOURCE FIBER OPTIC

FIG. 2

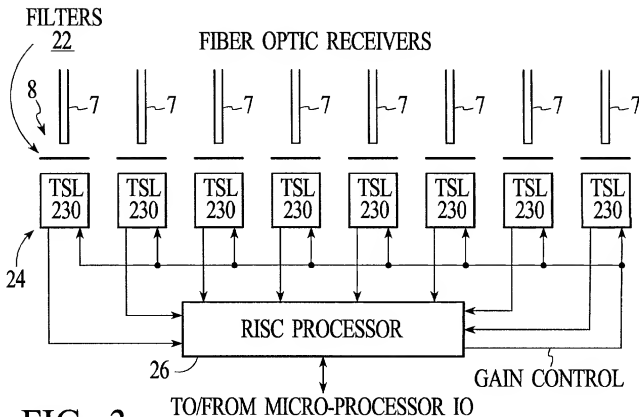


FIG. 3

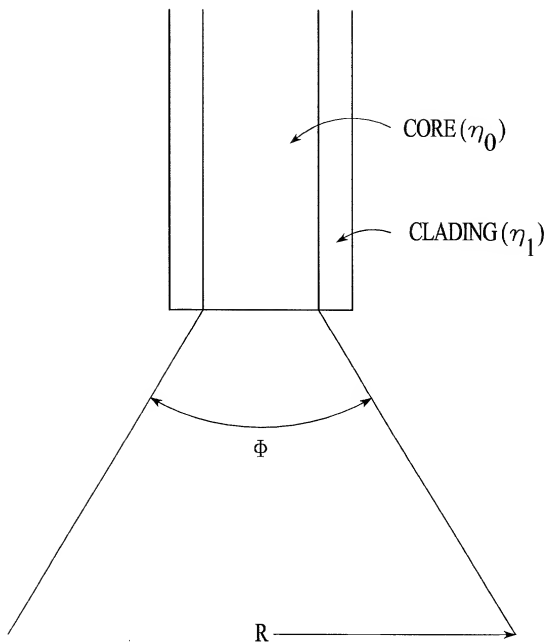


FIG. 4A

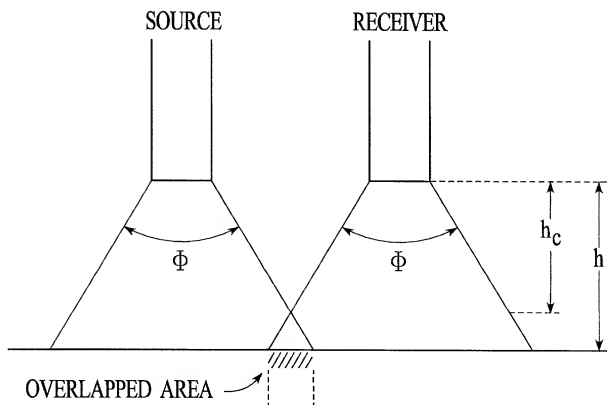


FIG. 4B

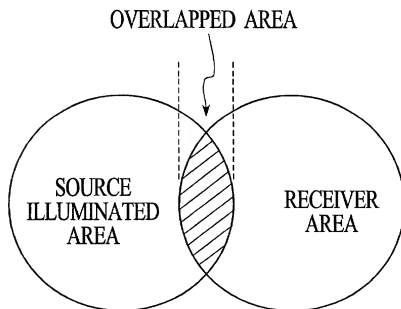


FIG. 4C

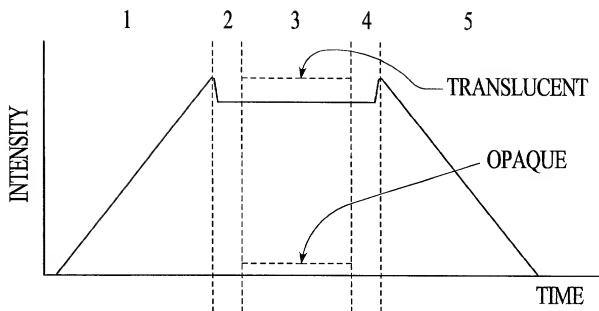


FIG. 5A

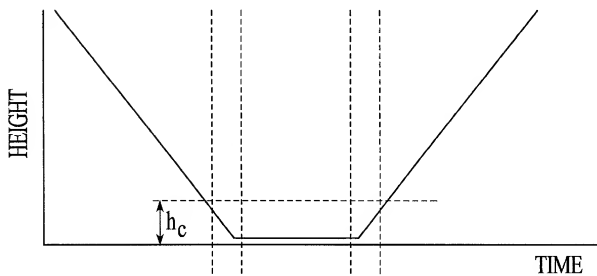
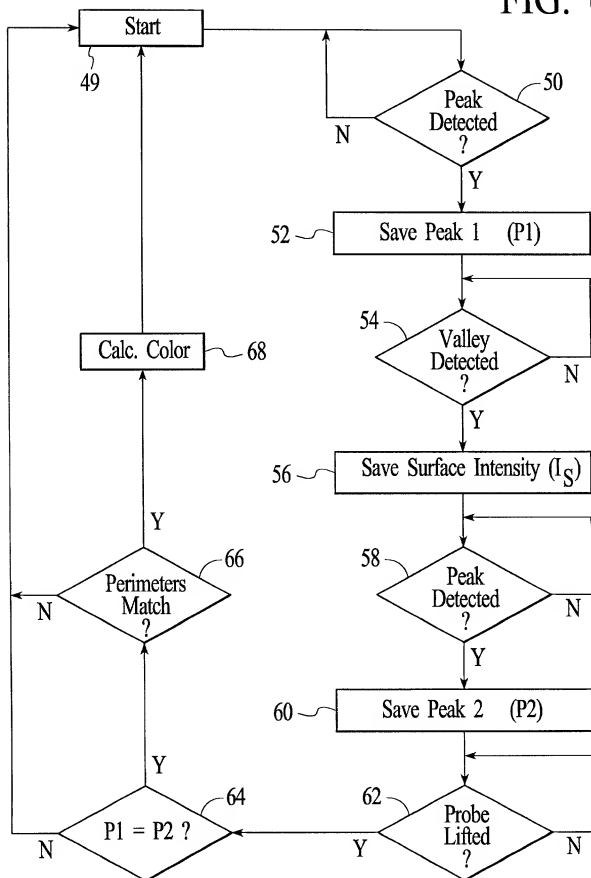


FIG. 5B

FIG. 6



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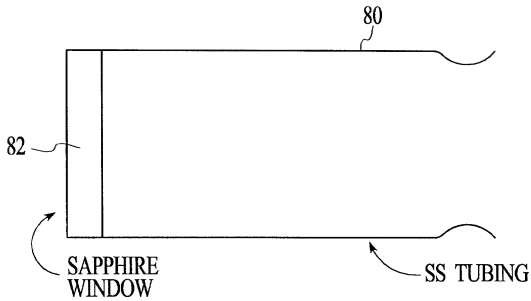


FIG. 7A

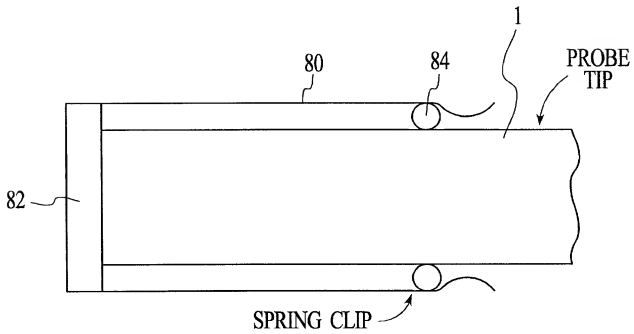


FIG. 7B

10039205.010402

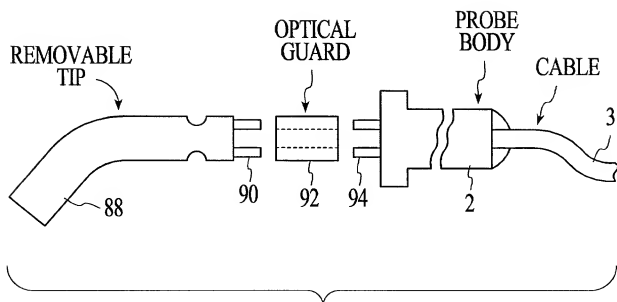


FIG. 8A

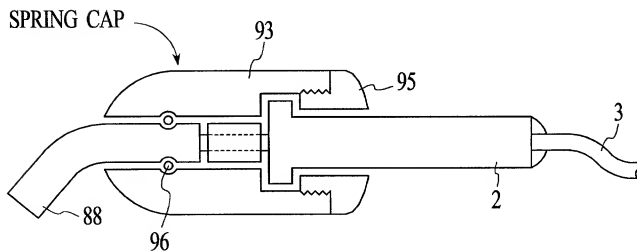
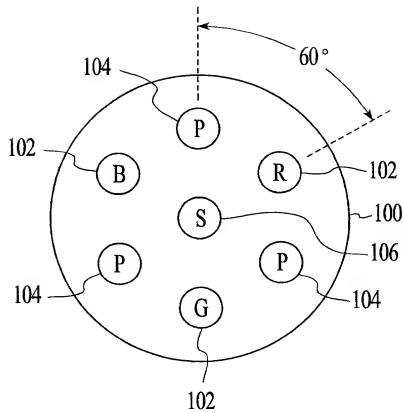


FIG. 8B



S - LIGHT SOURCE FIBER  
 R - RED RECEIVER  
 G - GREEN RECEIVER  
 B - BLUE RECEIVER  
 P - NEUTRAL (FULL BAND) RECEIVERS

FIG. 9

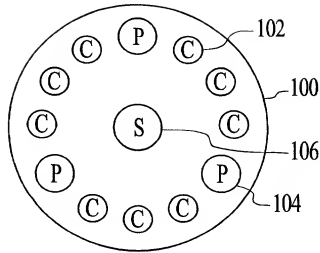


FIG. 10A

S - LIGHT SOURCE FIBER  
P - NEUTRAL (FULL BAND) RECEIVER  
C - COLOR RECEIVER

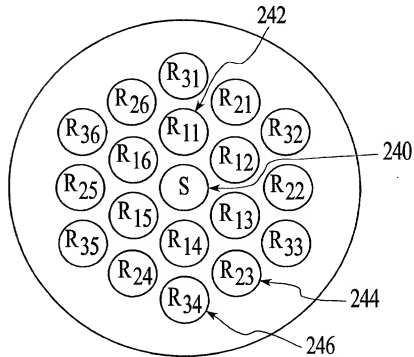


FIG. 10B

S - LIGHT SOURCE FIBER  
R<sub>1X</sub> - INNER RING RECEIVER FIBER  
R<sub>2X</sub> - 2nd RING RECEIVER FIBER  
R<sub>3X</sub> - 3rd RING RECEIVER FIBER

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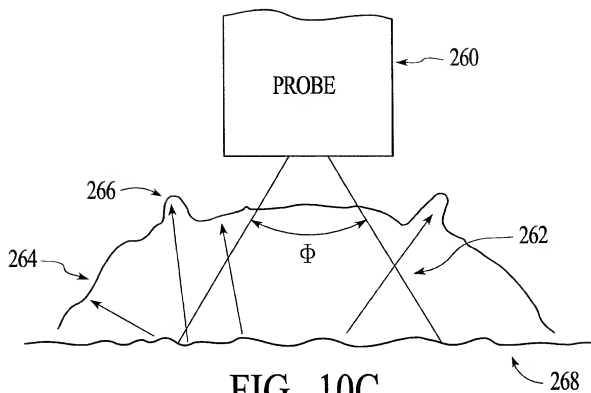


FIG. 10C

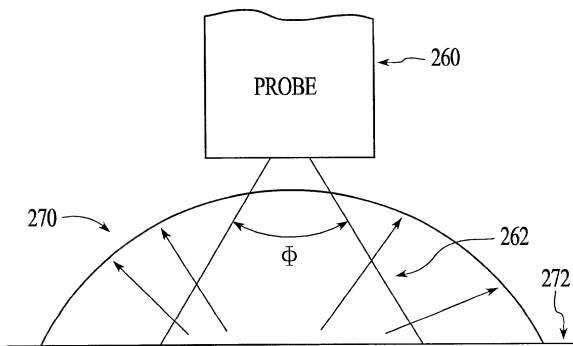


FIG. 10D

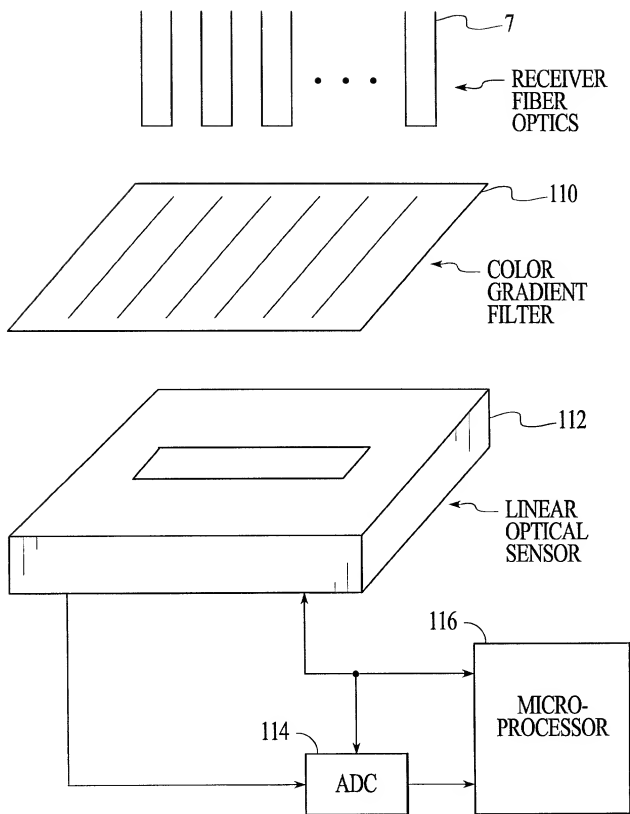


FIG. 11

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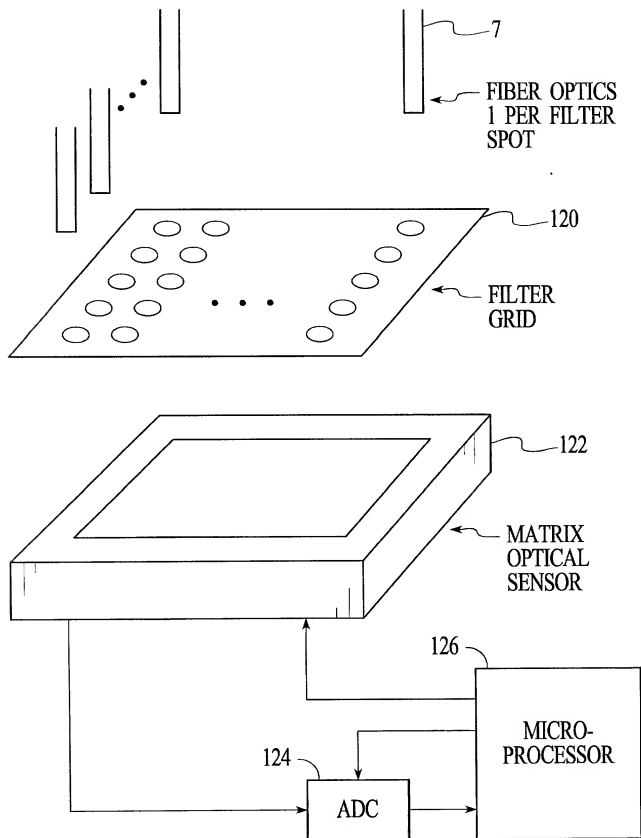


FIG. 12

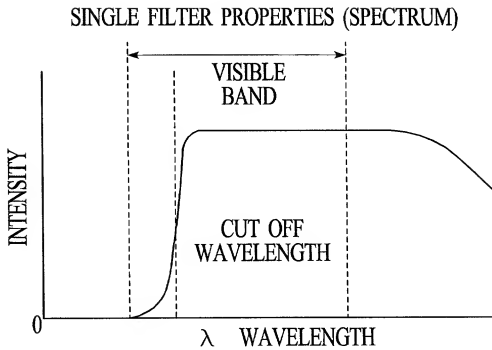


FIG. 13A

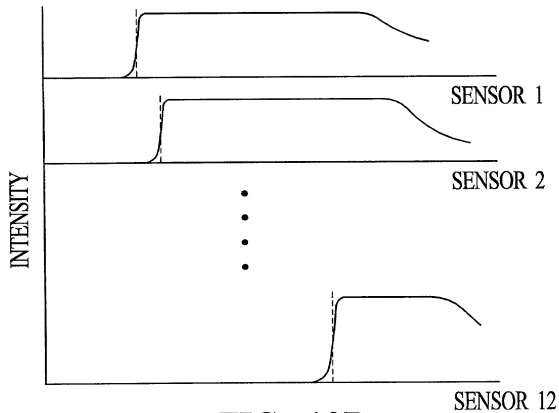


FIG. 13B

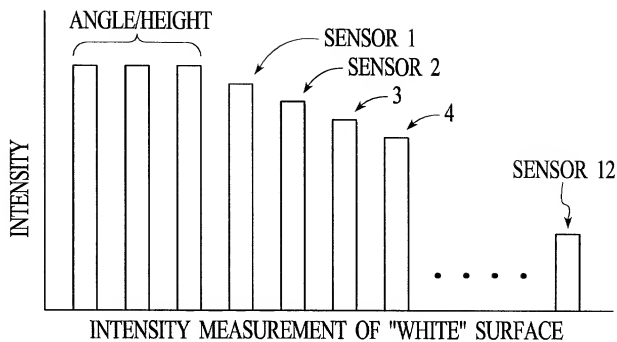


FIG. 14A

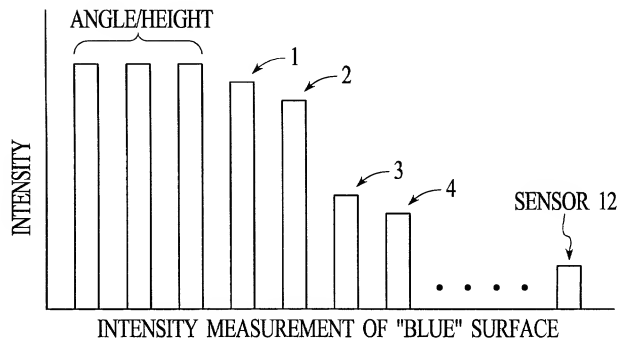


FIG. 14B

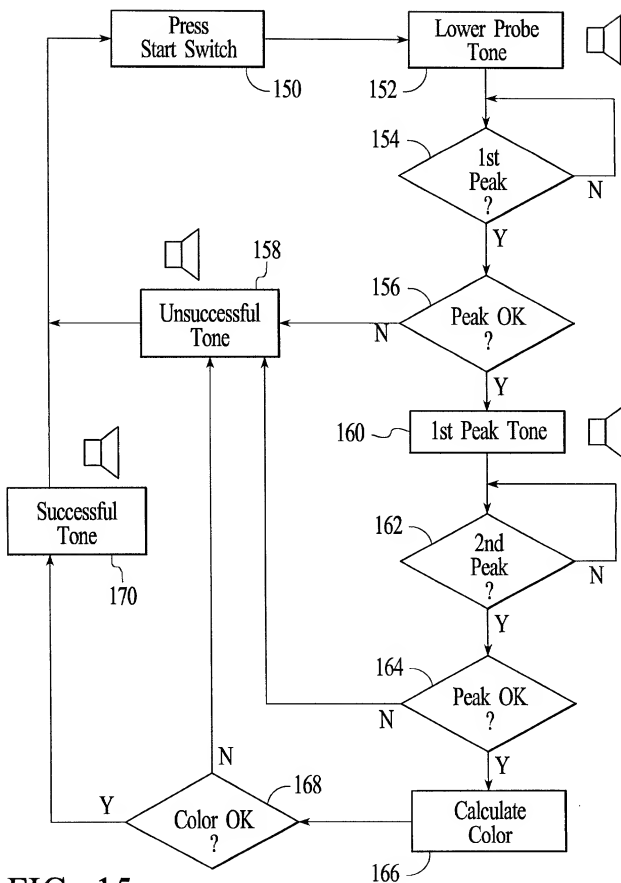


FIG. 15

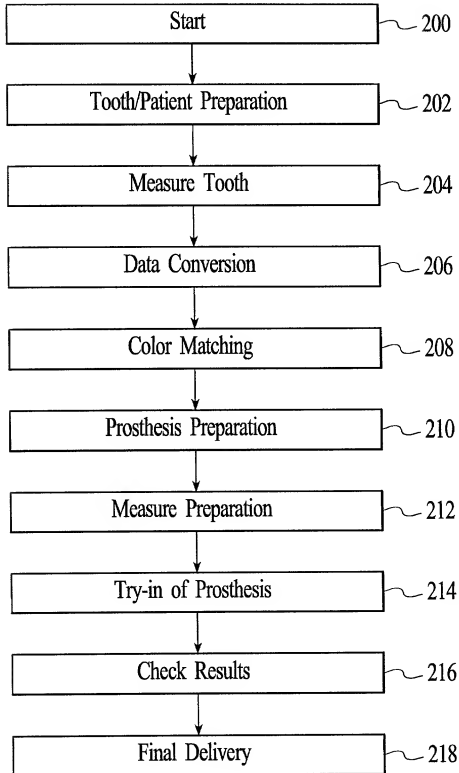


FIG. 16A

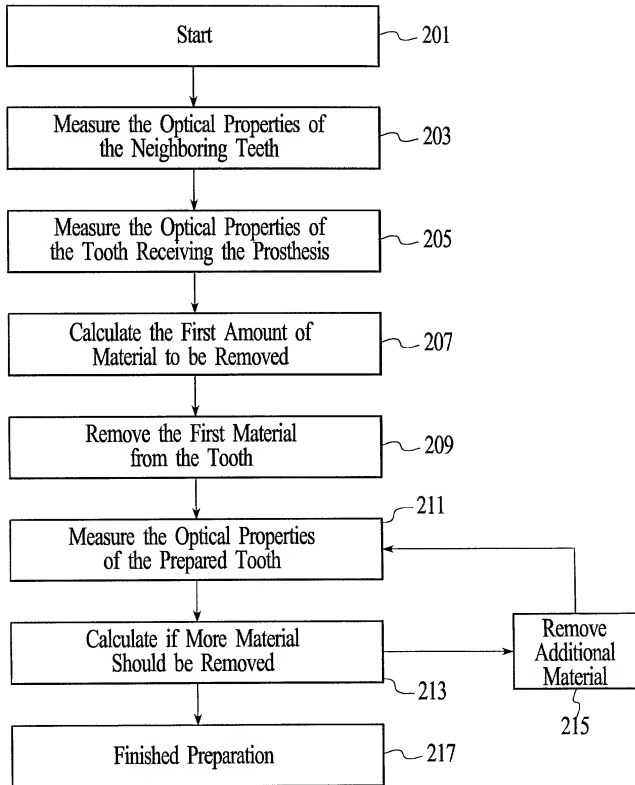


FIG. 16B

## INTRAORAL POSITIONING DEVICE

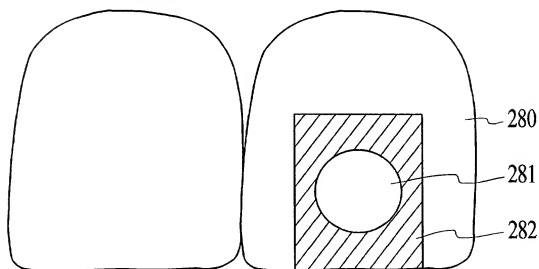


FIG. 17A

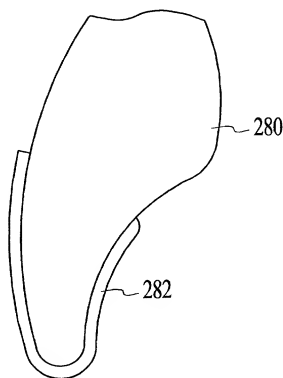


FIG. 17B

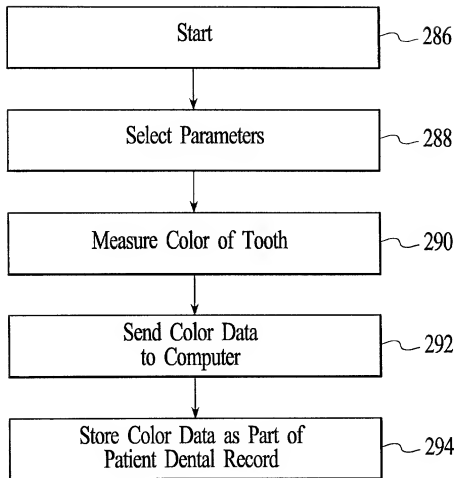


FIG. 18

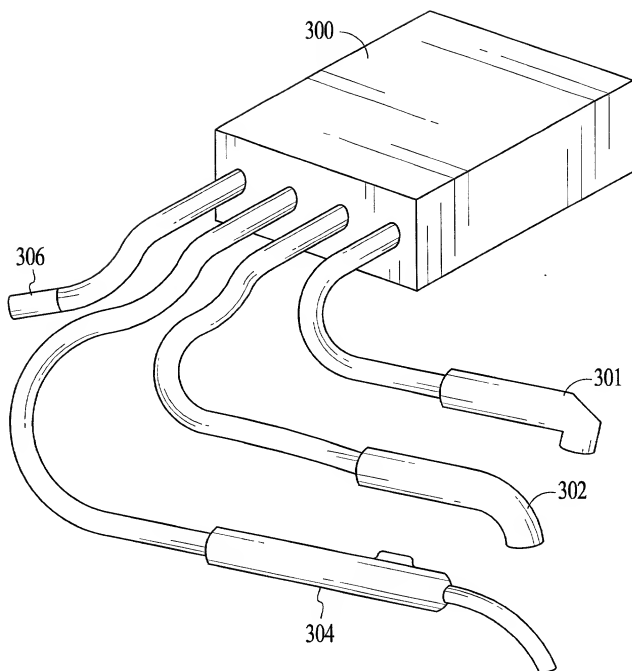


FIG. 19

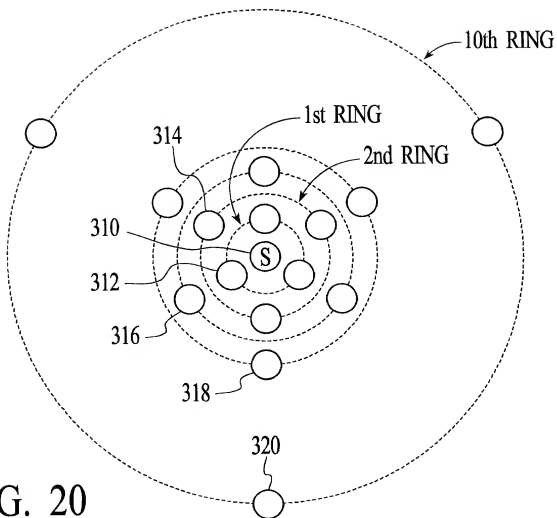


FIG. 20

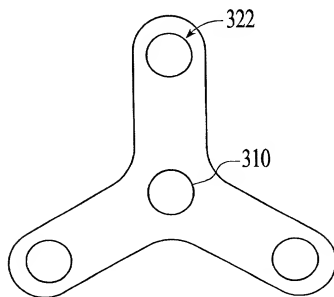


FIG. 21

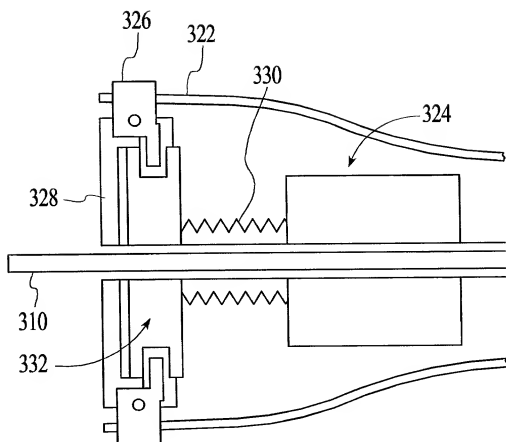
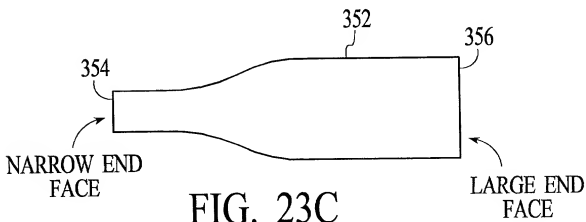
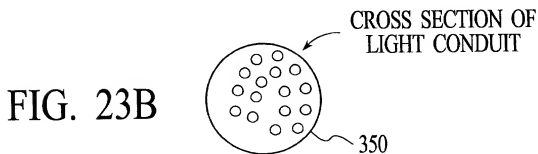
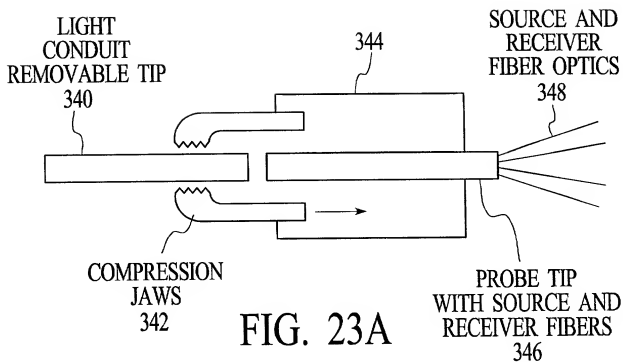


FIG. 22



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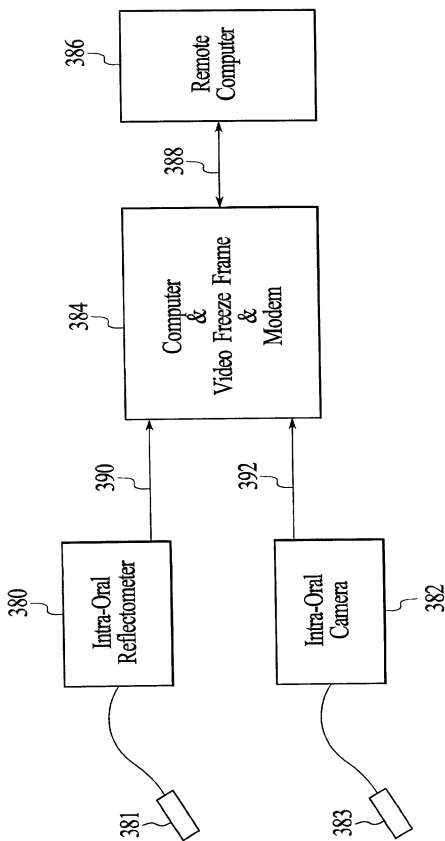


FIG. 24

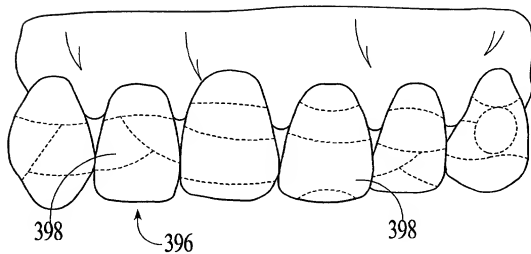


FIG. 25

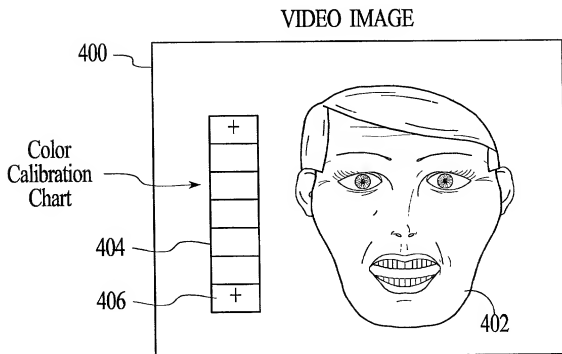


FIG. 26

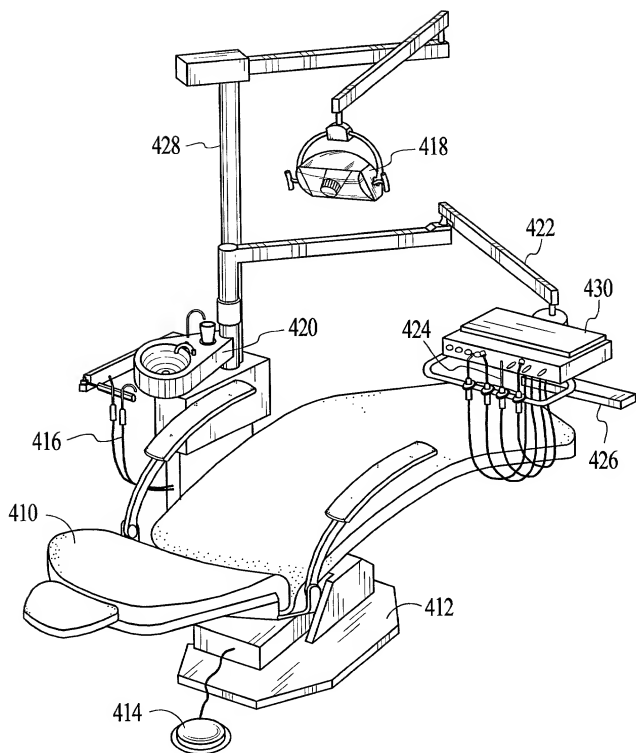


FIG. 27

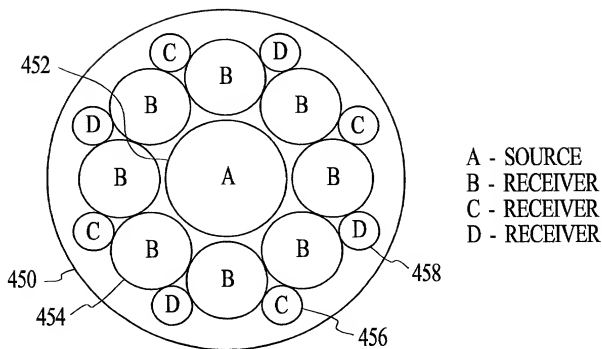


FIG. 28A

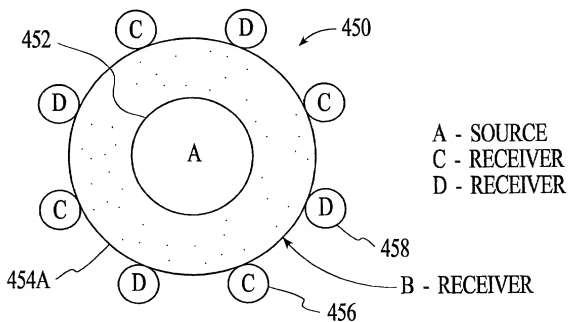


FIG. 28B

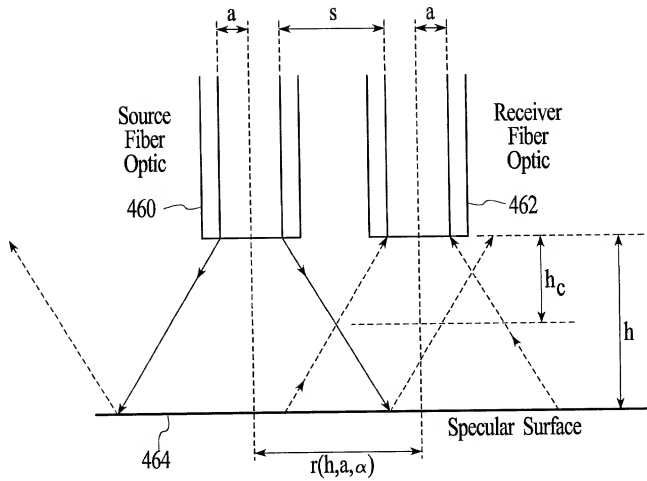


FIG. 29

FIG. 30A

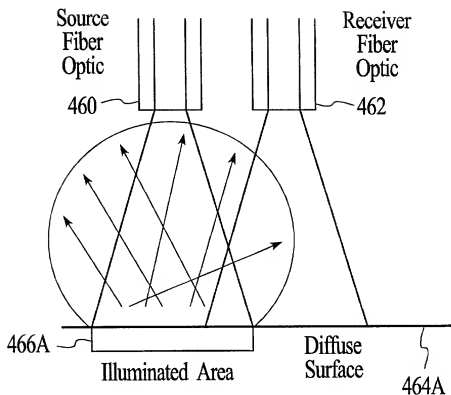
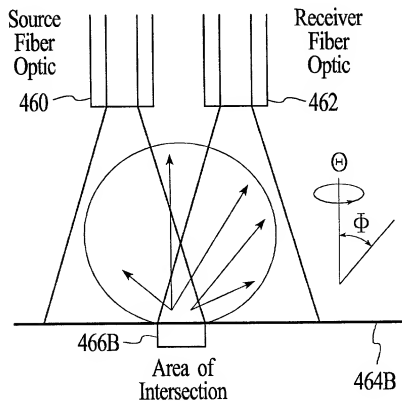


FIG. 30B



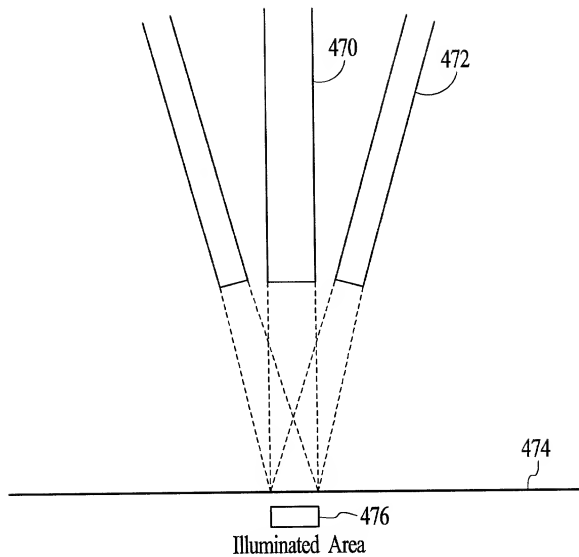


FIG. 31A

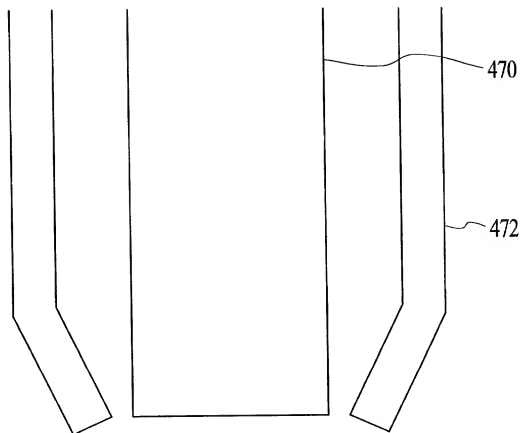


FIG. 31B

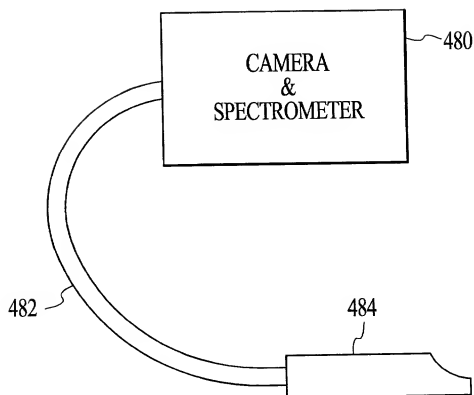


FIG. 32

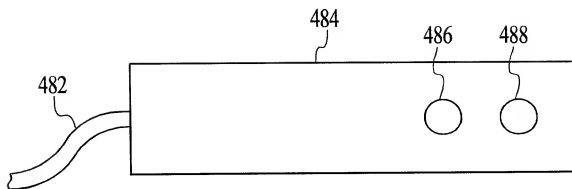


FIG. 33

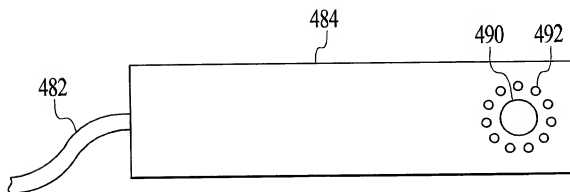


FIG. 34

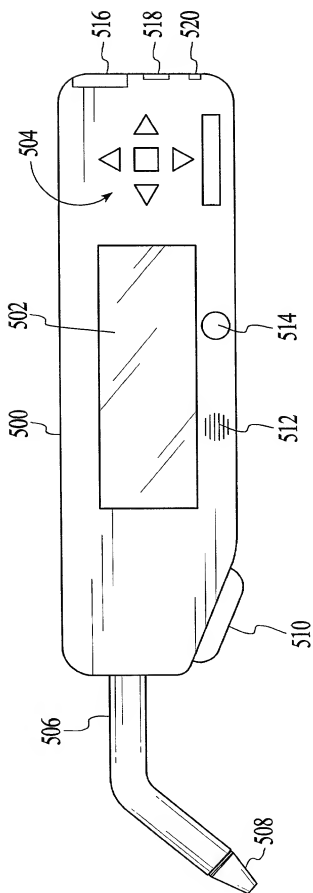
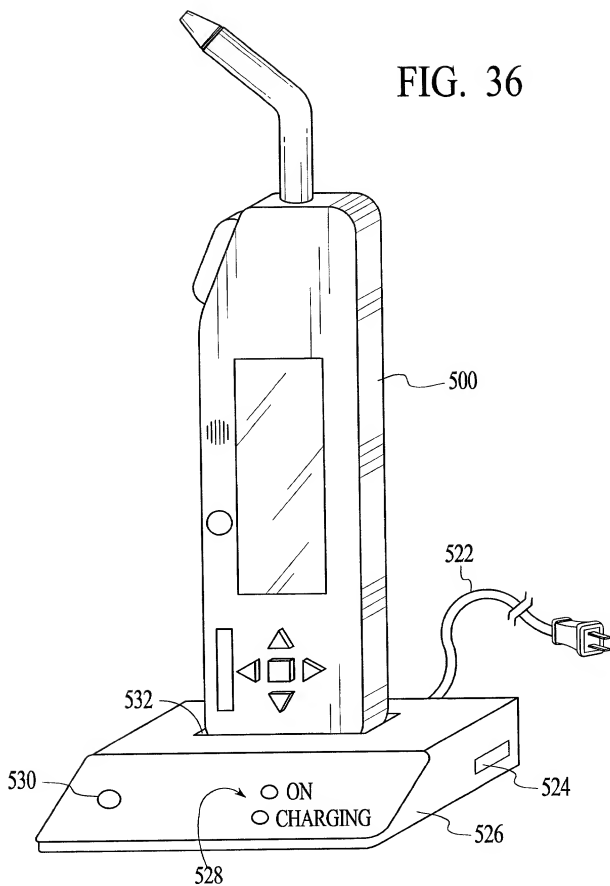
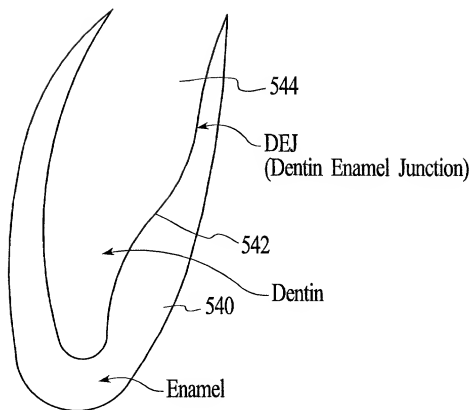


FIG. 35

FIG. 36





Enamel - Dentin Layers

LIGHT REFLECTION AND SCATTERING

FIG. 37A

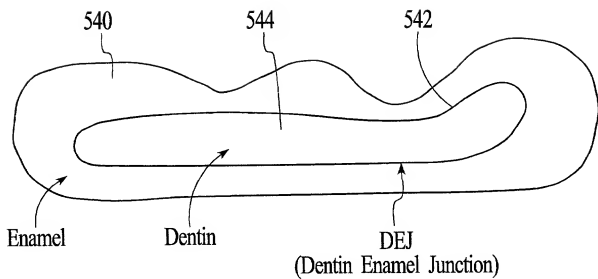
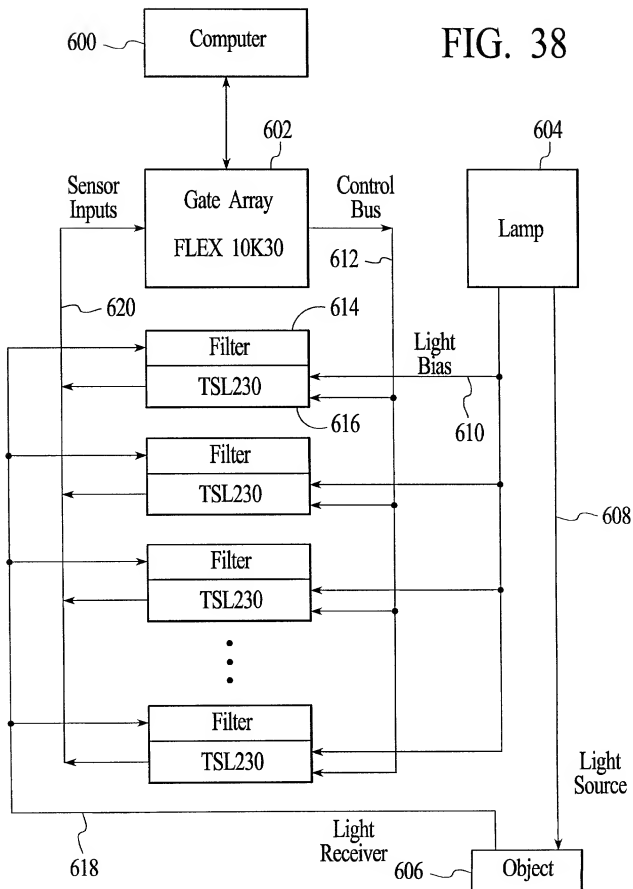


FIG. 37B

FIG. 38



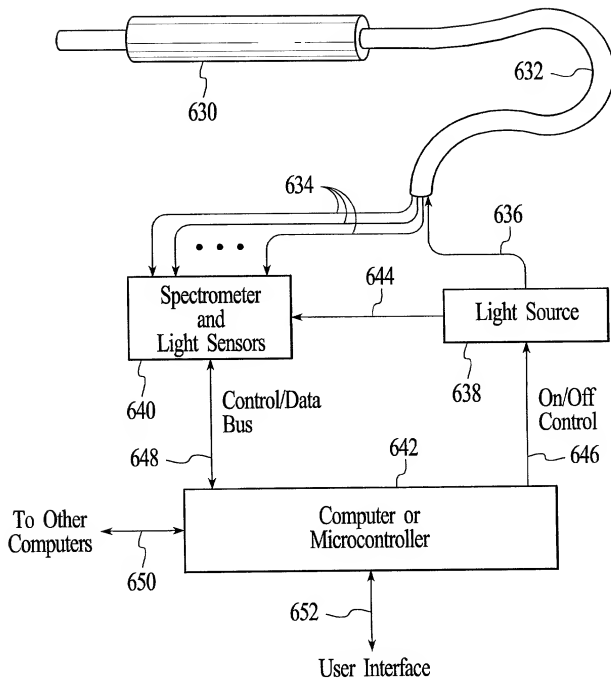


FIG. 39

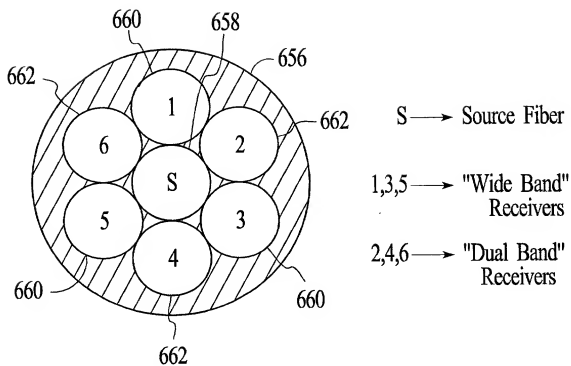
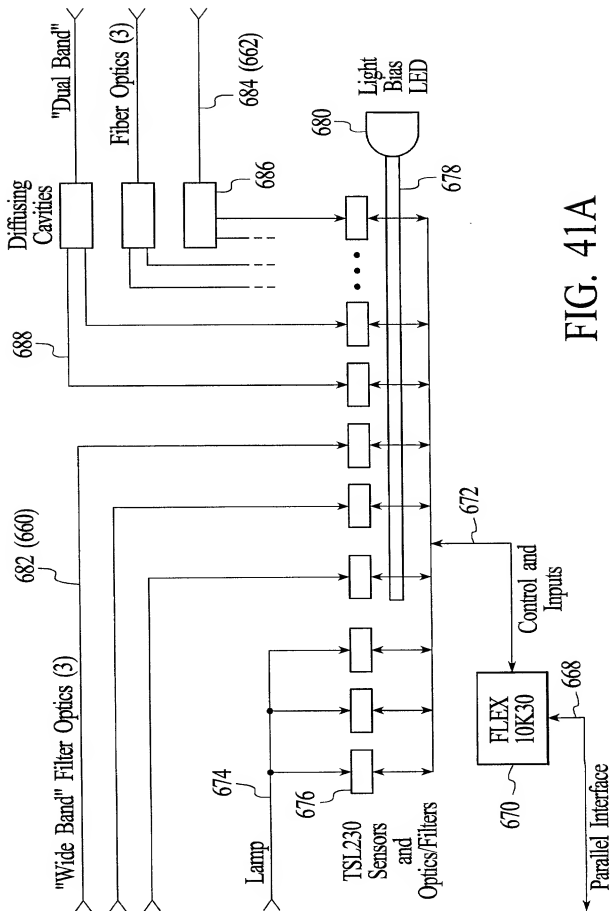


FIG. 40



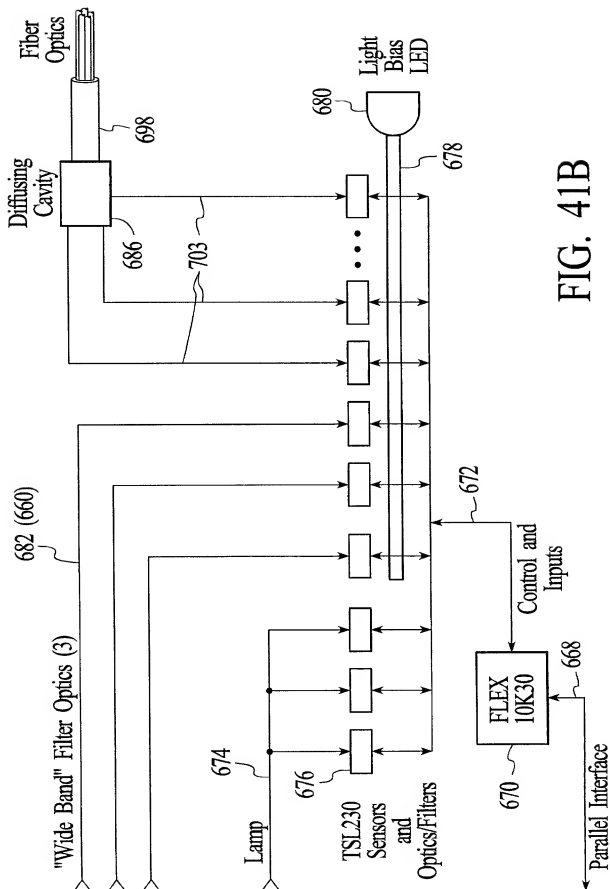


FIG. 41B

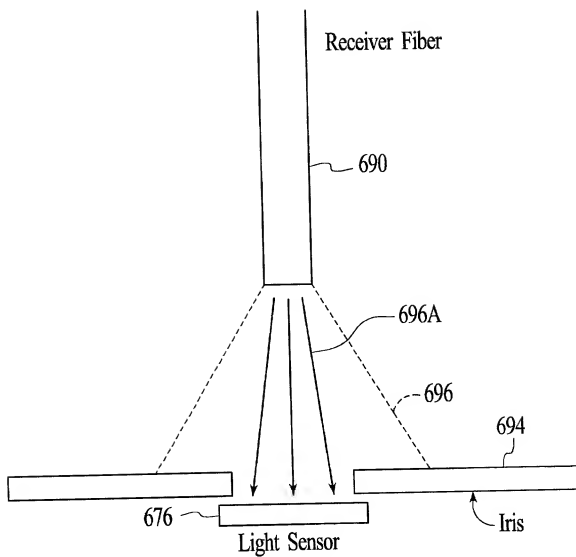


FIG. 42

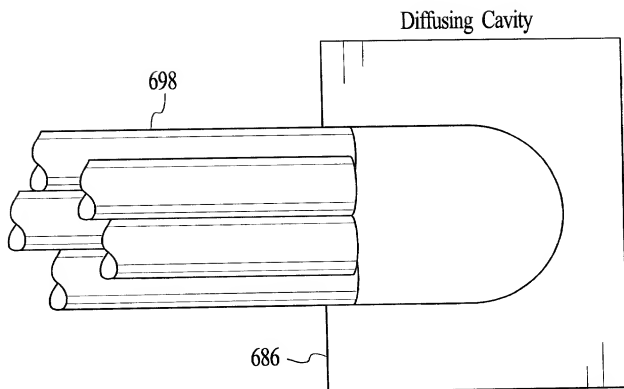


FIG. 43A

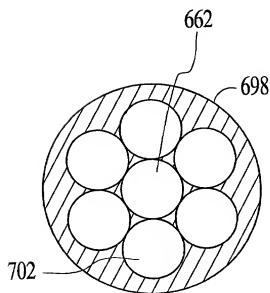


FIG. 43B

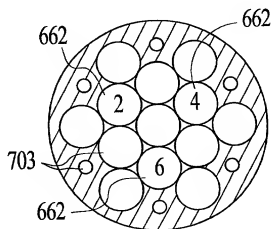


FIG. 43C

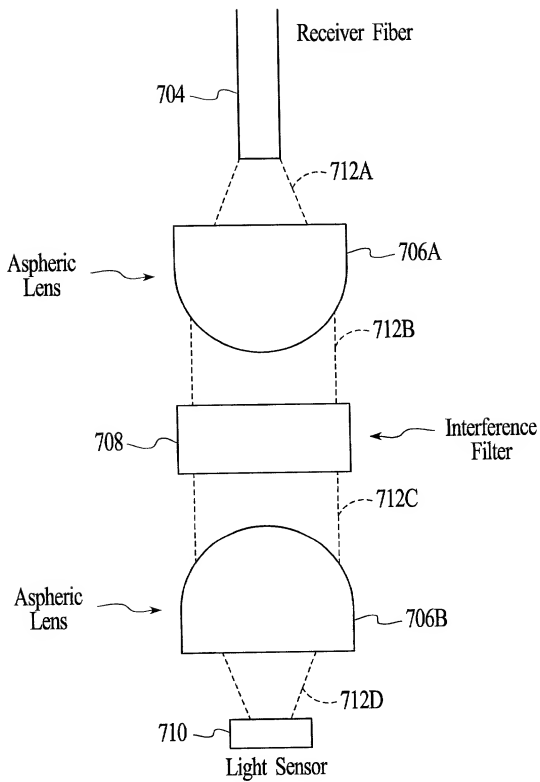


FIG. 44

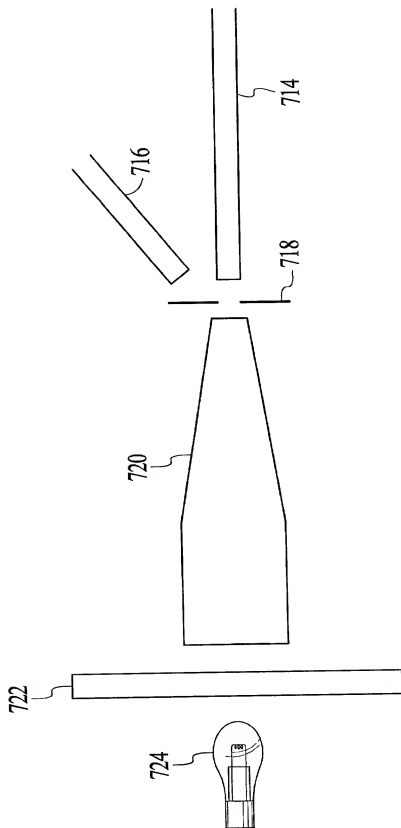


FIG. 45

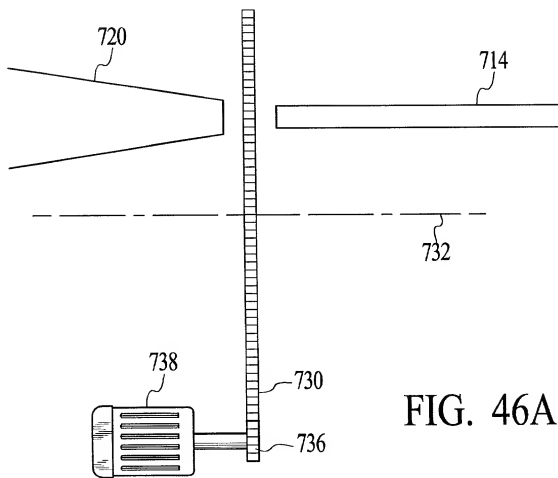


FIG. 46A

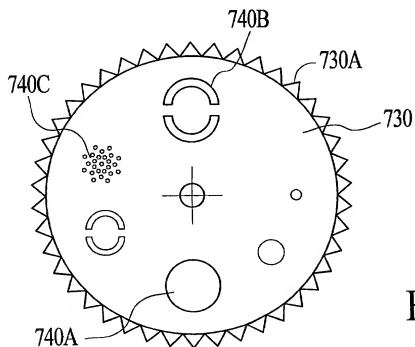


FIG. 46B

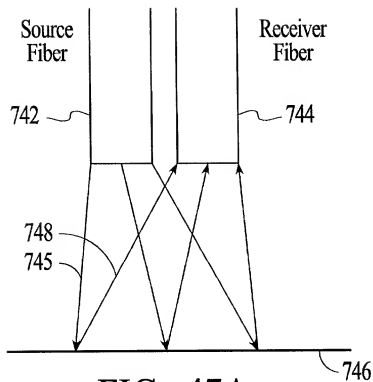


FIG. 47A

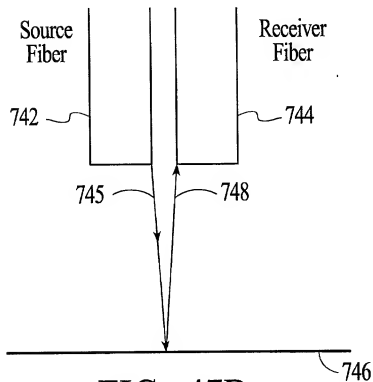


FIG. 47B

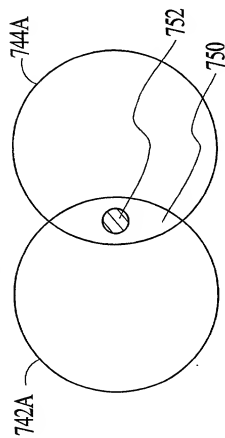
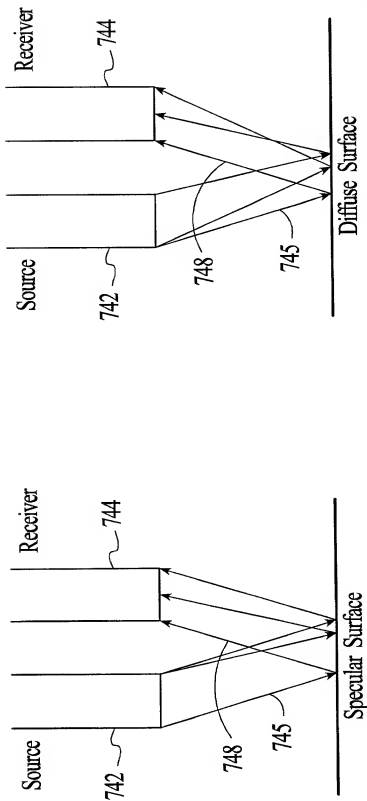


FIG. 48A

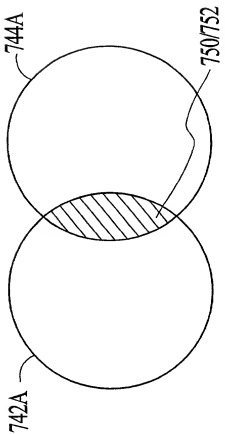
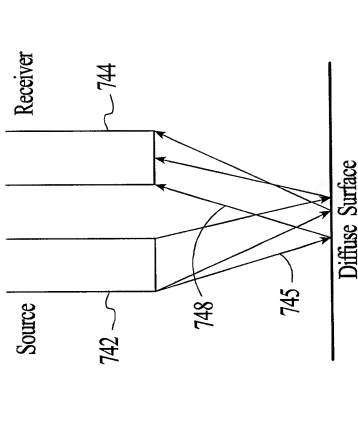


FIG. 48B

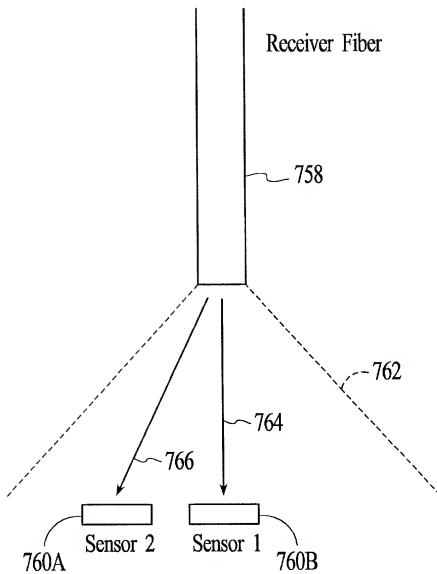


FIG. 49

## INTENSITY SPECULAR

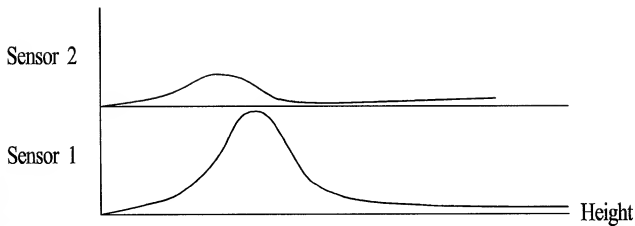


FIG. 50A

## INTENSITY DIFFUSE

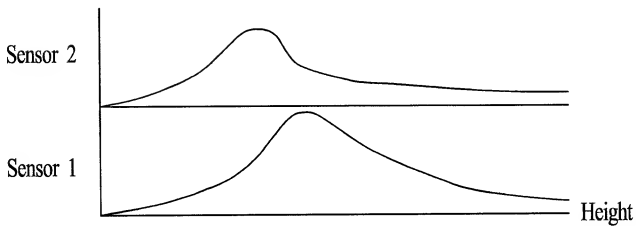
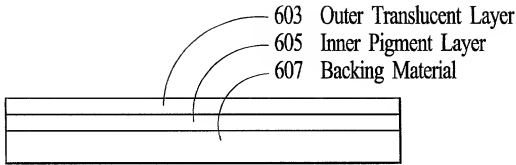


FIG. 50B



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FIG. 51A

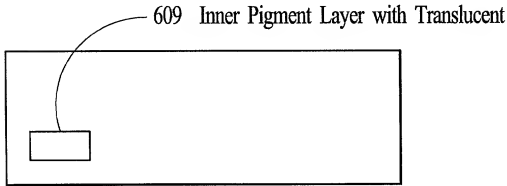
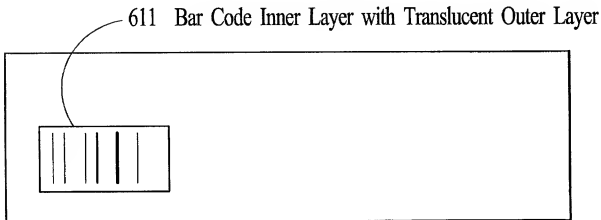


FIG. 51B



601

FIG. 51C

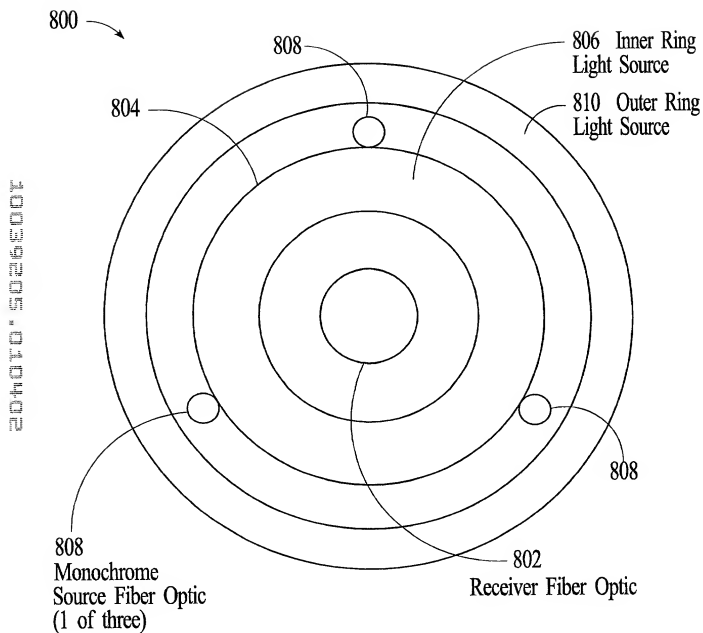


FIG. 52

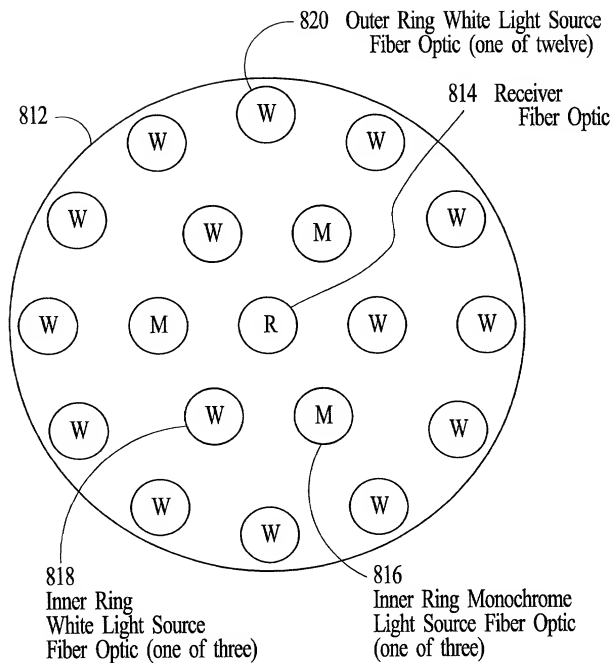


FIG. 53

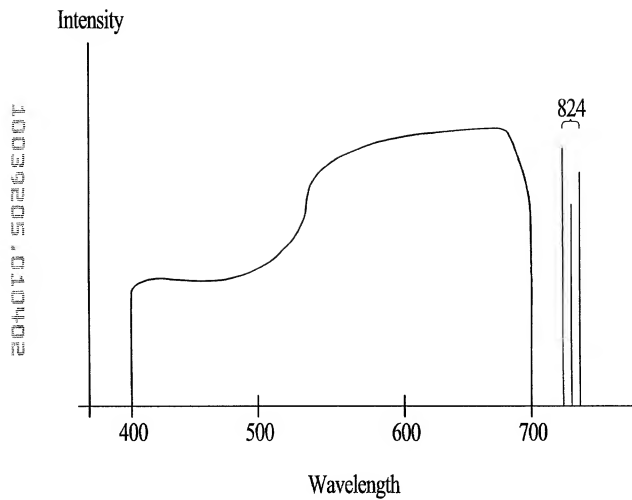


FIG. 54

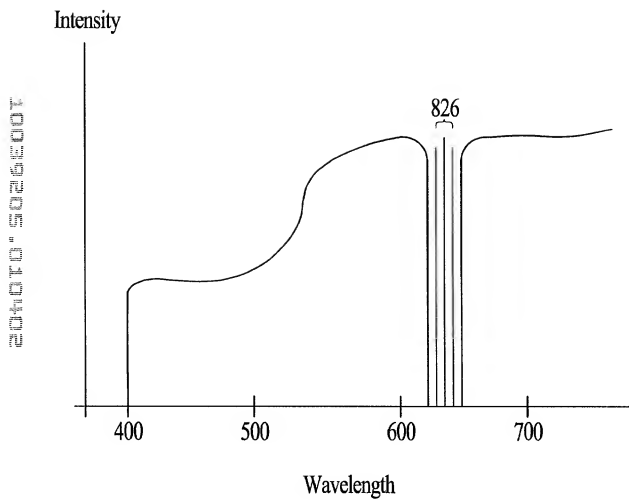
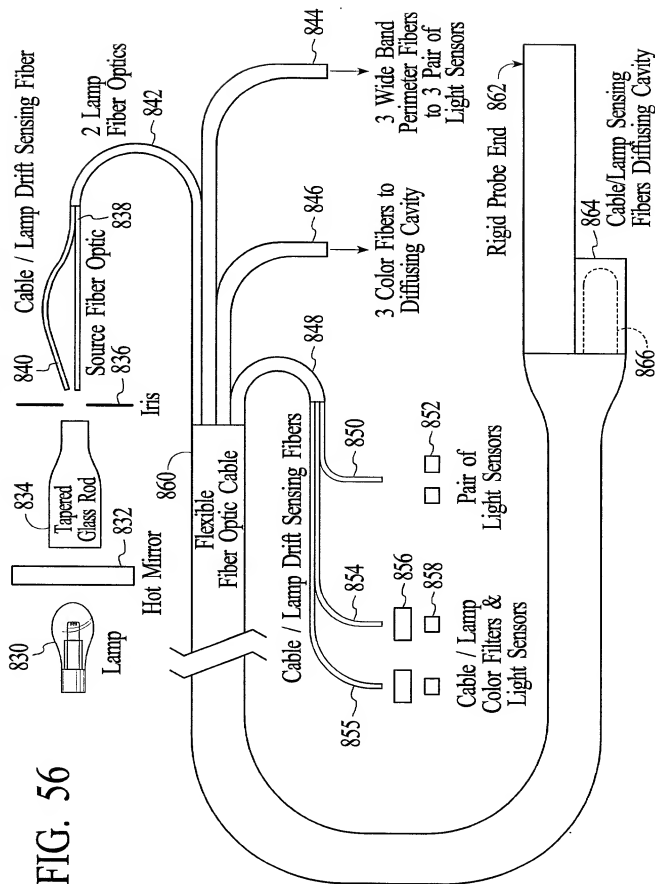


FIG. 55

FIG. 56



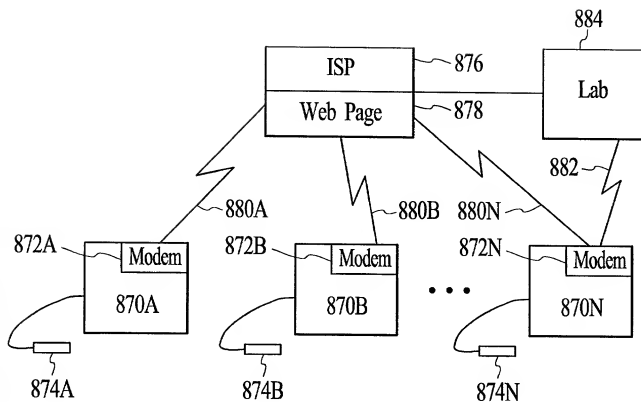


FIG. 57

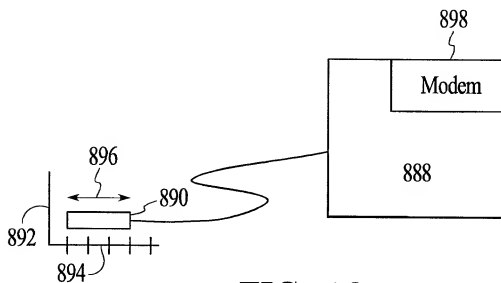


FIG. 58

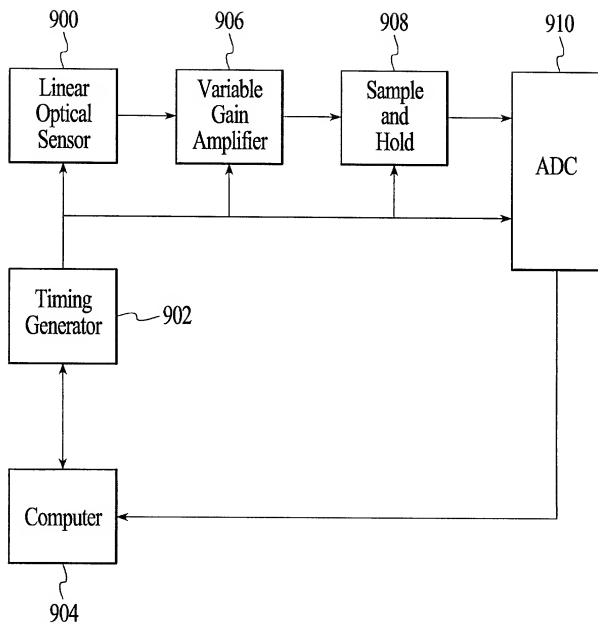


FIG. 59

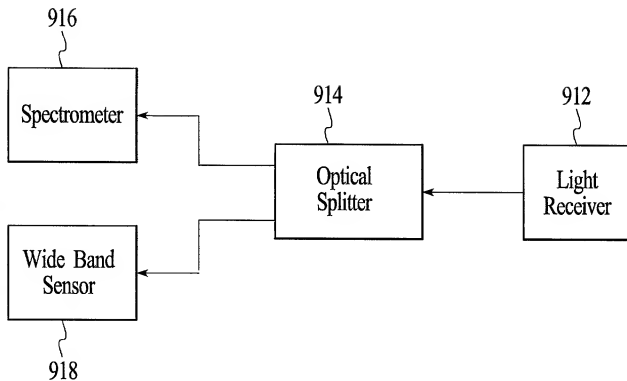


FIG. 60

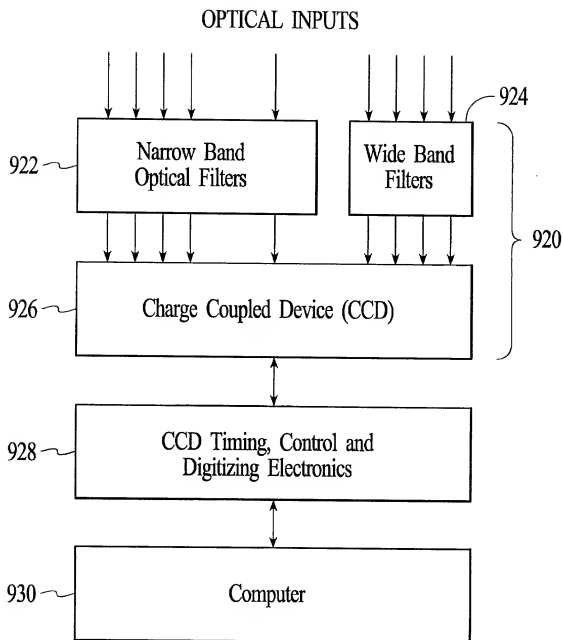


FIG. 61

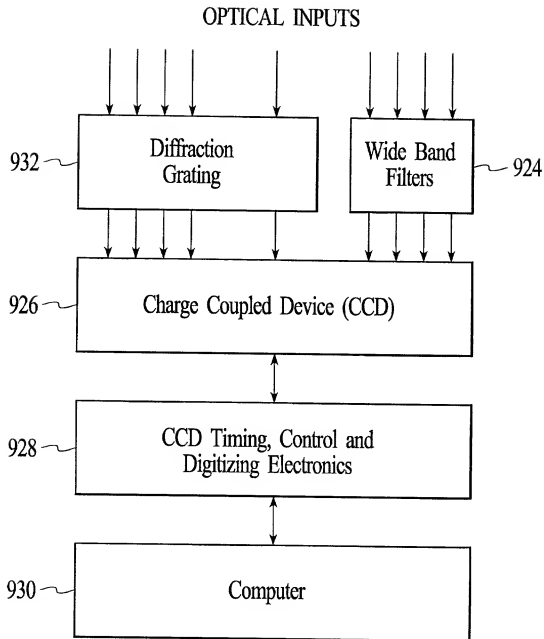


FIG. 62



FIG. 64

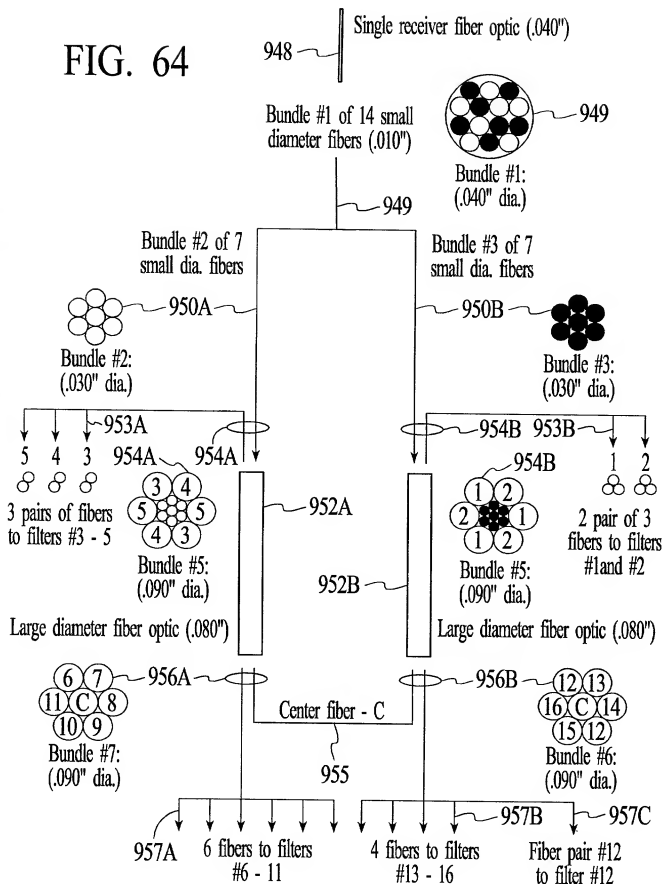
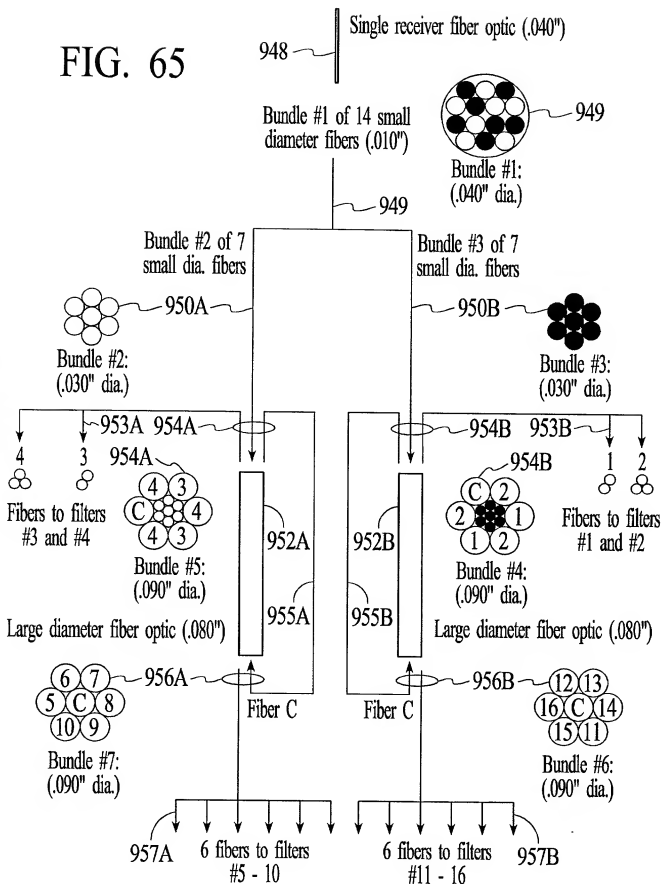


FIG. 65



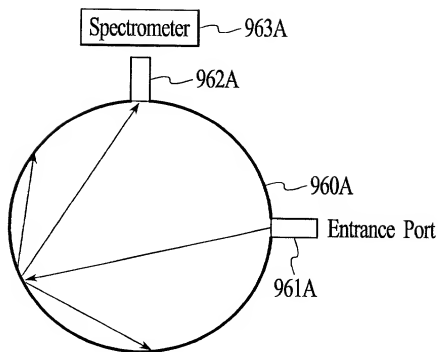


FIG. 66A

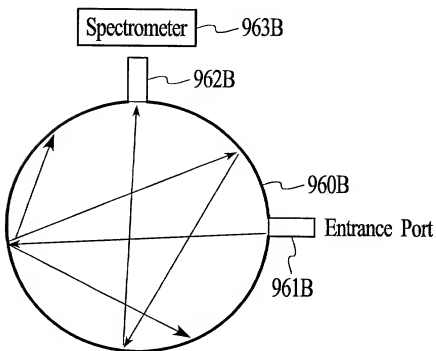


FIG. 66B

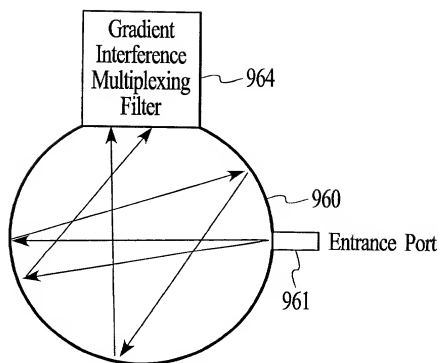


FIG. 67A

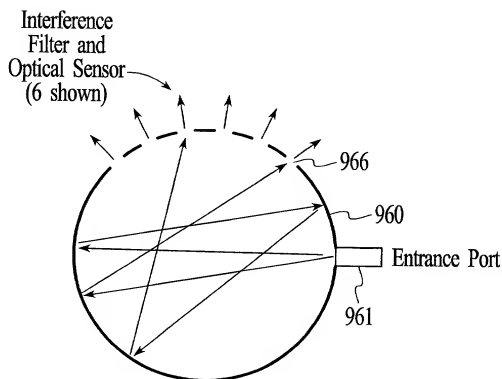


FIG. 67B

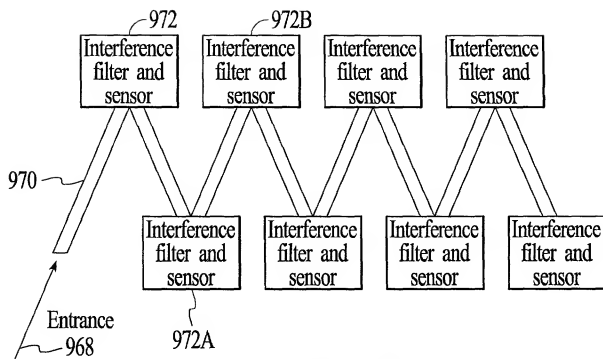


FIG. 68

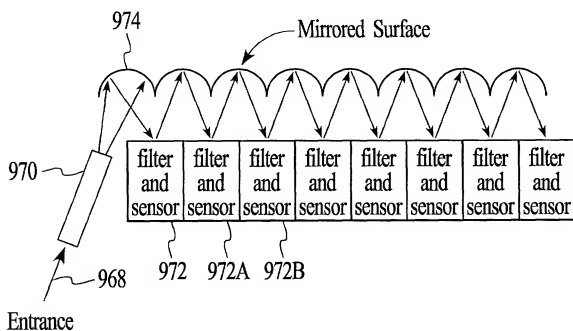


FIG. 69

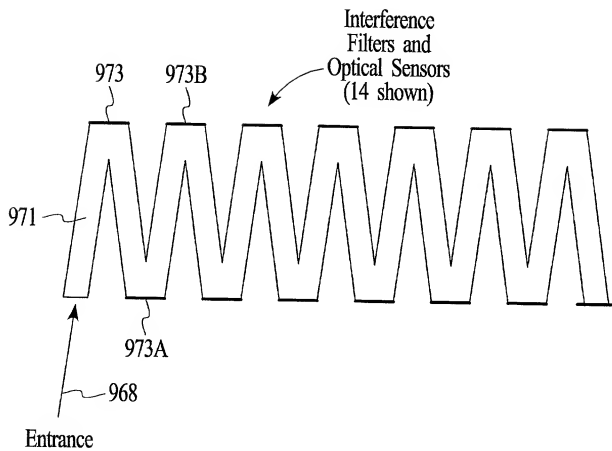
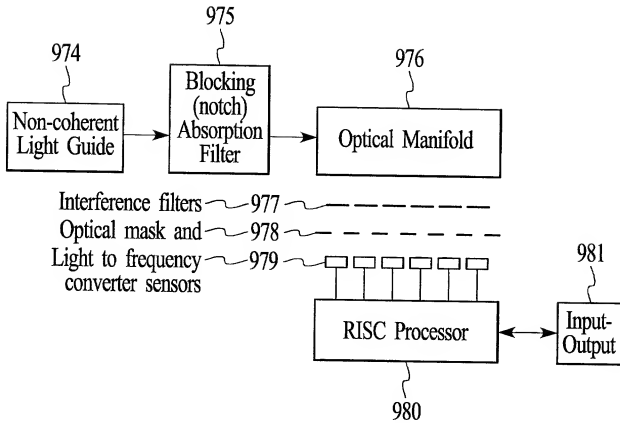
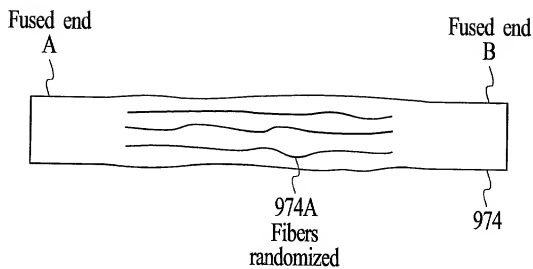


FIG. 70



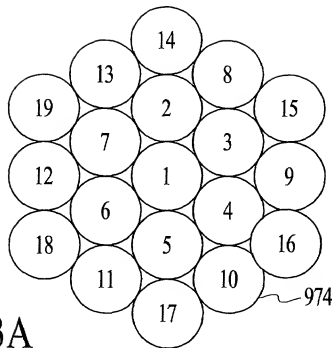
Block Diagram

FIG. 71

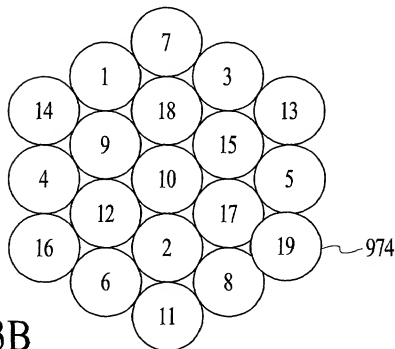


Non-Coherent Light Guide

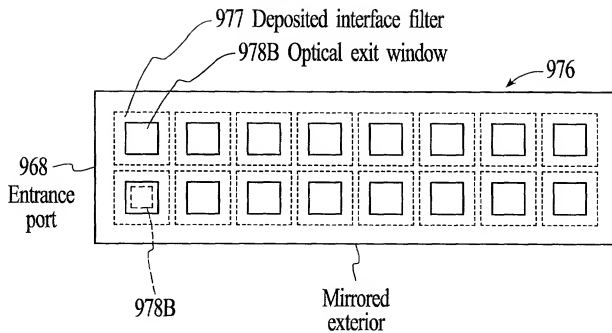
FIG. 72



Non-Coherent Light Guide End View A



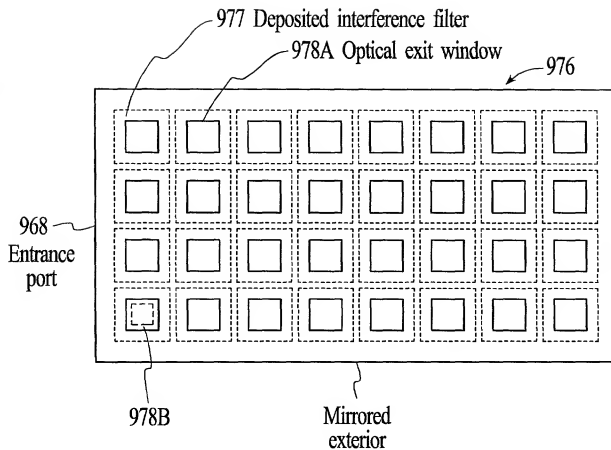
Non-Coherent Light Guide End View B



Optical Manifold

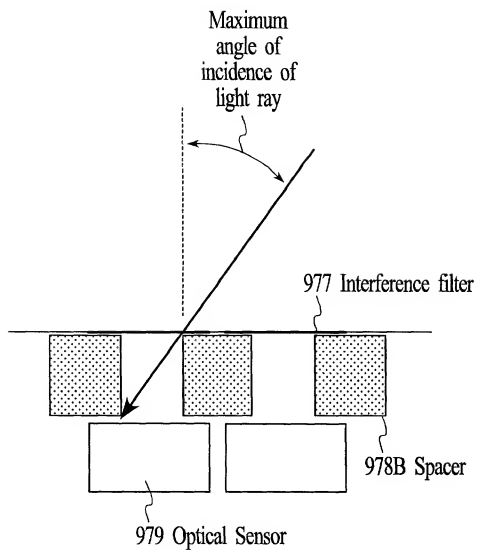
FIG. 74A

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Optical Manifold A Exit Port Detail

FIG. 74B



Optical Manifold Spacer

FIG. 75

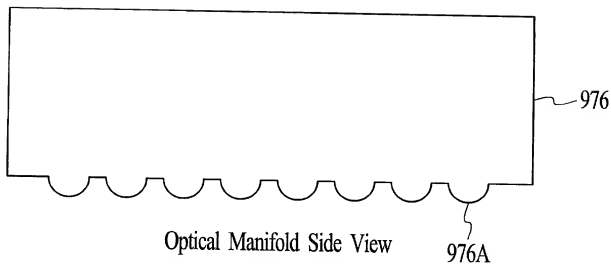
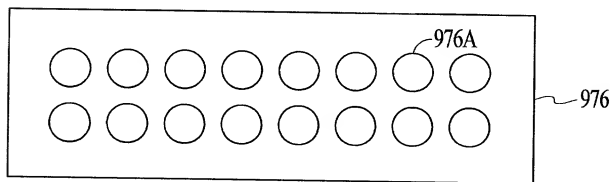
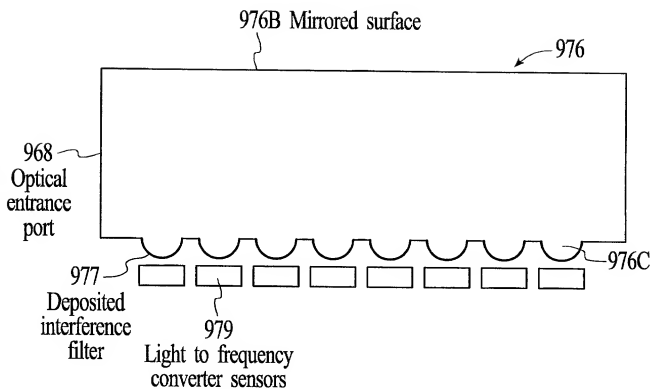


FIG. 76A



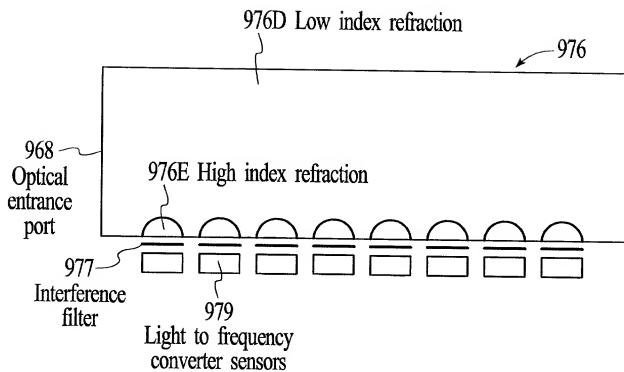
Optical Manifold Bottom View

FIG. 76B



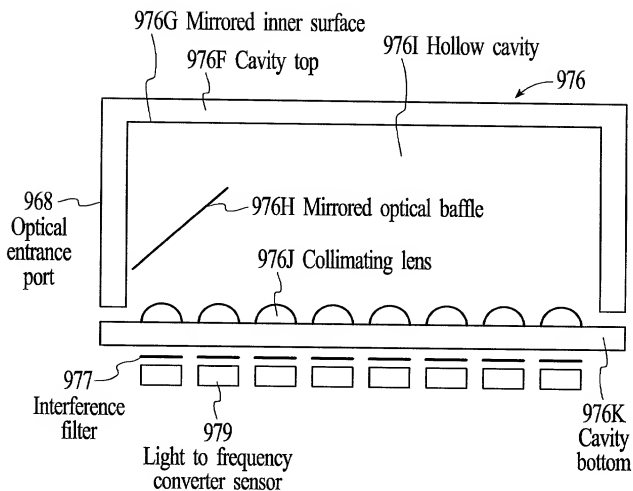
Optical Manifold with Collimation Lenses

FIG. 77



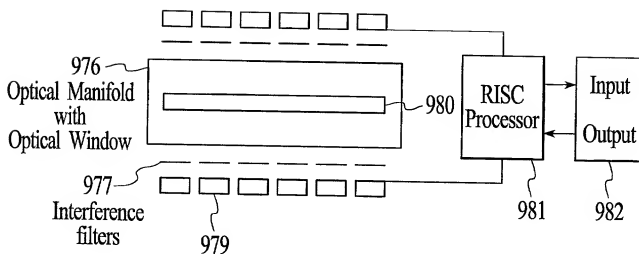
Optical Manifold with Collimation Lenses Constructed from Two Optical Materials with Different Indexes of Refraction

FIG. 78



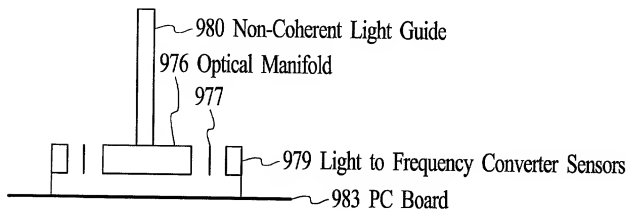
Optical Manifold with Collimating  
Lenses and Hollow Cavity and Baffle

FIG. 79



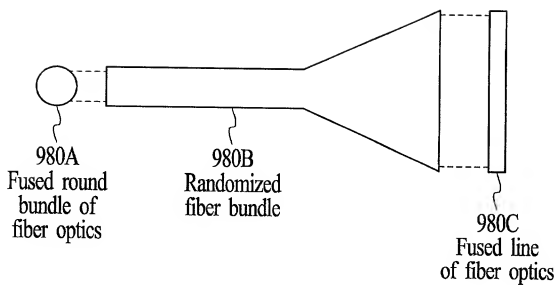
Top View

FIG. 80A



Side View

FIG. 80B



Round to Line Non-Coherent Light Guide

FIG. 81

## Round to Line Non-Coherent Light Guide

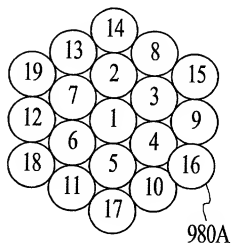


FIG. 82A

## Non-Coherent Light Guide Round End

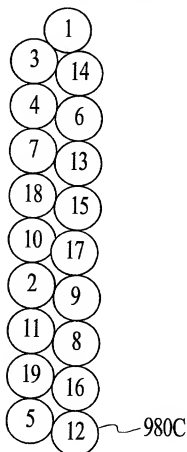
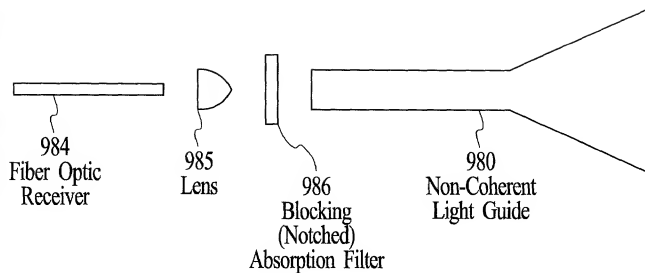


FIG. 82B

## Non-Coherent Light Guide Line End



Round to Line Non-Coherent Light Guide  
with Lens and Absorption Filters

FIG. 83

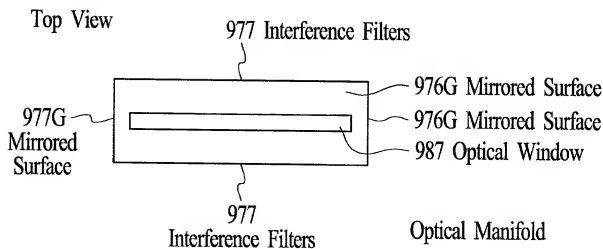


FIG. 84A

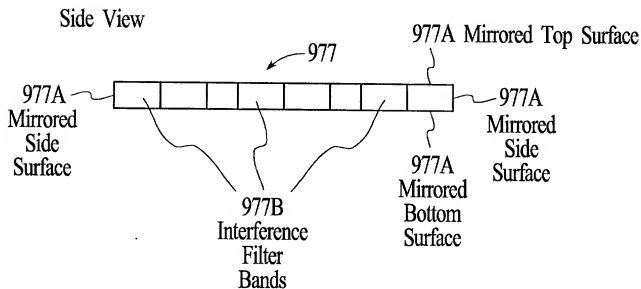


FIG. 84B

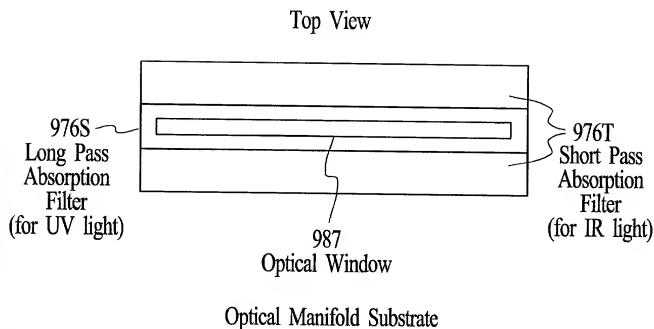


FIG. 85A

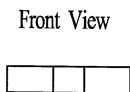
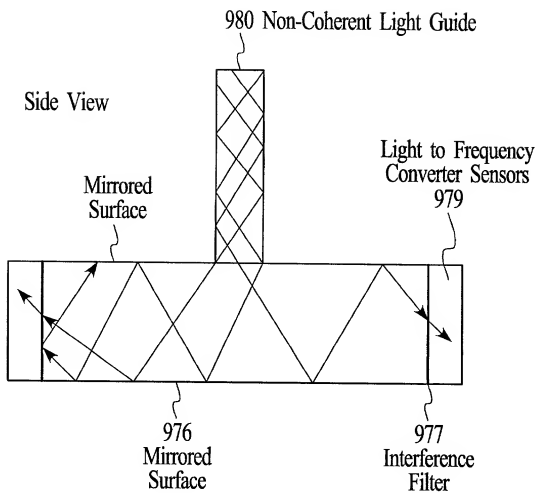
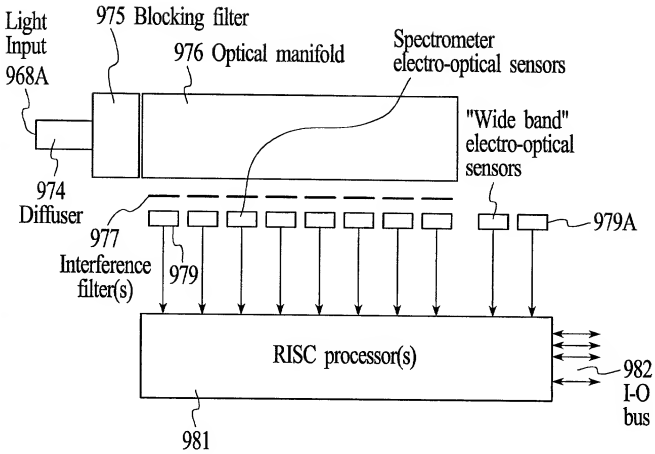


FIG. 85B



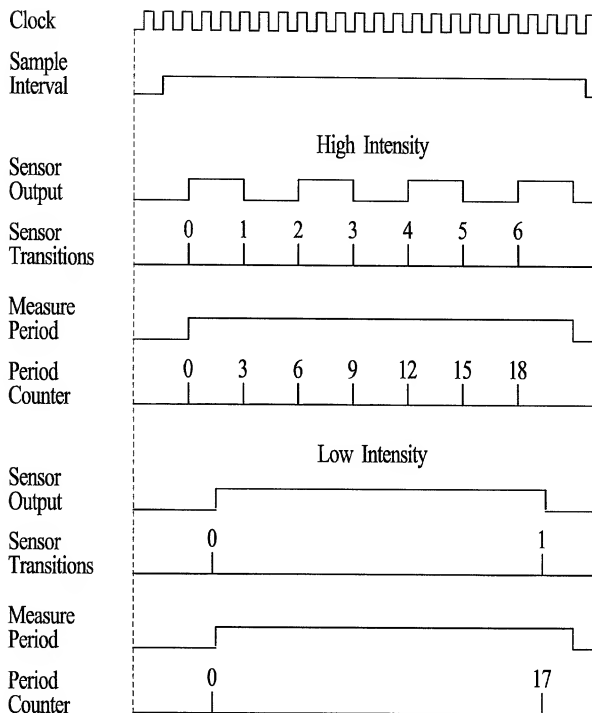
Ray Diagram

FIG. 86



Pocket Spectrometer™ Block Diagram

FIG. 87



Optical Sensors Intensity Measurement Examples

FIG. 88

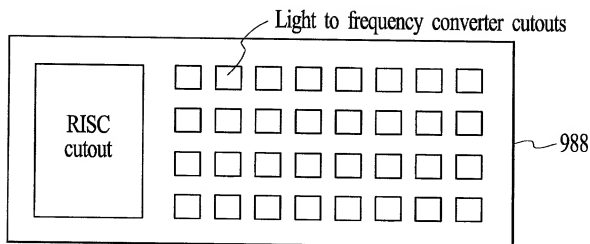


FIG. 89A

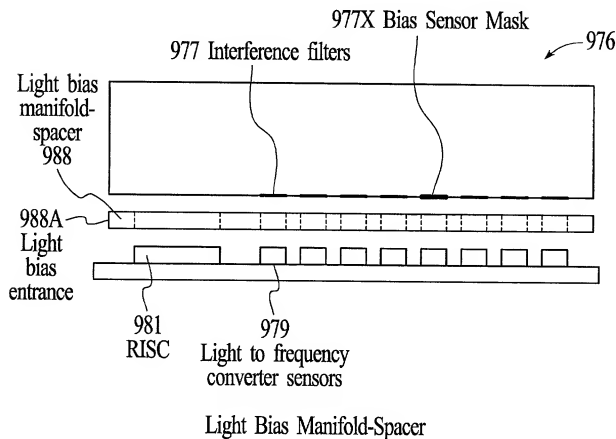
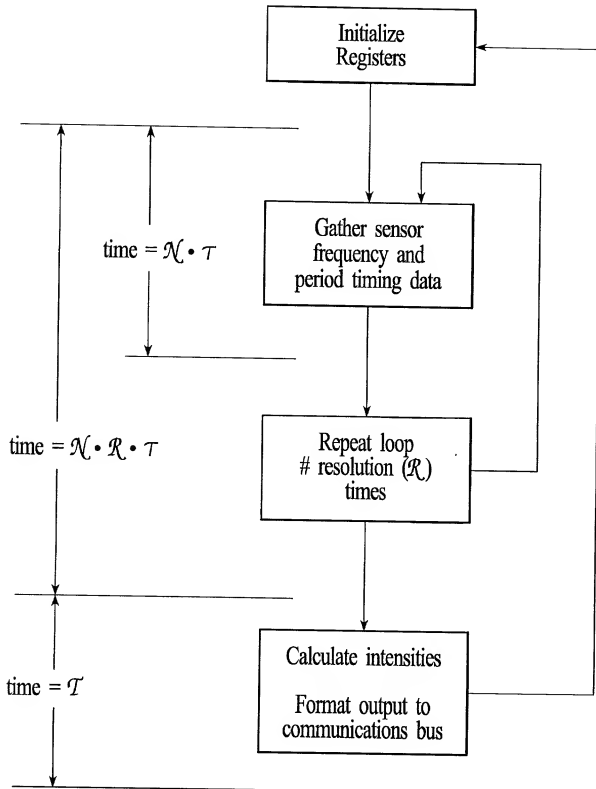


FIG. 89B



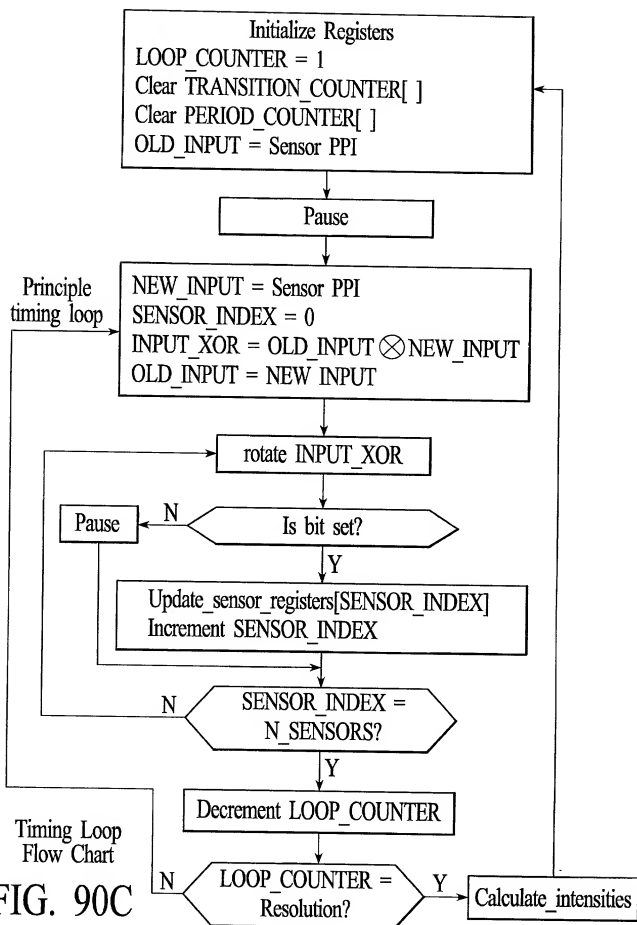
RISC Software Timing Flow Chart

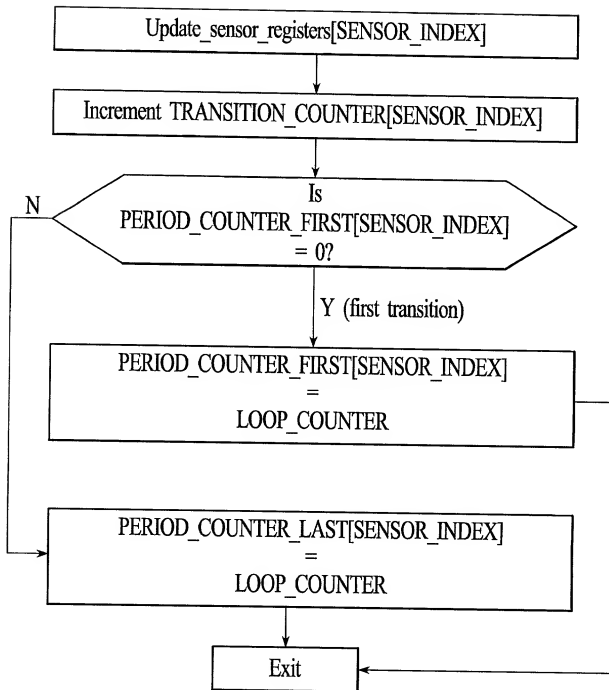
FIG. 90A

Register	Description
LOOP_COUNTER	Number of times the sensor is sampled in the timing loop. This register determines the resolution of the measurement and it also determines the sampling rate. The larger the resolution is, the lower the sampling rate.
NEW_INPUT	New sensor(s) input - each sensor input is one bit
OLD_INPUT	Former sensor input
INPUT_XOR	XOR new and old inputs
N_SENSOR	Number of sensors
SENSOR_INDEX	Index to the sensor being tested
TRANSITION_COUNTER[N_SENSOR]	Array - number of transitions that occurred for sensors
PERIOD_COUNTER_FIRST[N_SENSOR]	Array - number of timing loops executed prior to first sensor transitions
PERIOD_COUNTER_LAST[N_SENSOR]	Array - number of loops that occurred prior to final transition
INTENSITY[N_SENSOR]	Array - calculated intensity for sensor

Timing Loop Register Descriptions

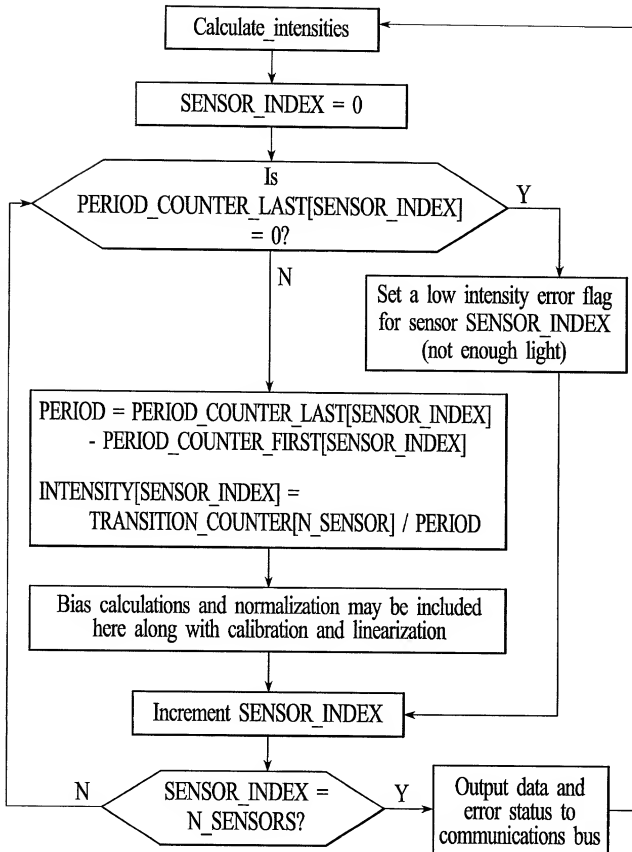
FIG. 90B





Transition Determination Flow Chart

FIG. 90D

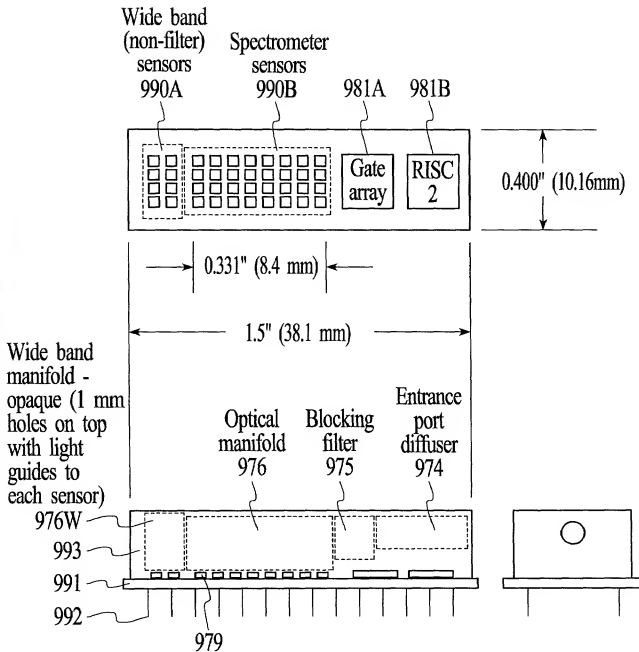


Intensity Calculations Flow Chart

FIG. 90E

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Pocket Spectrometer™ Physical, 40 Sensors

FIG. 91

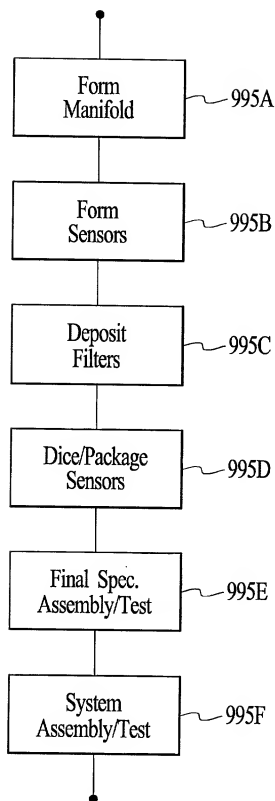


FIG. 92

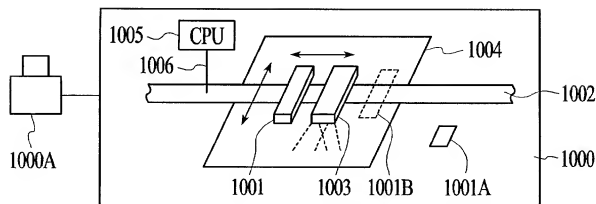


FIG. 93

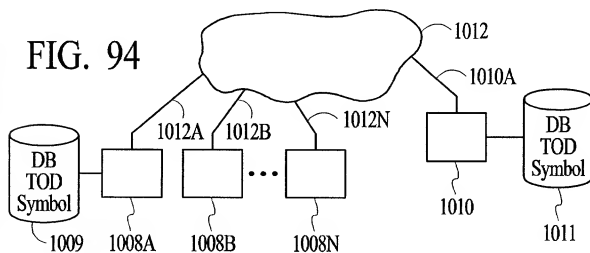


FIG. 94

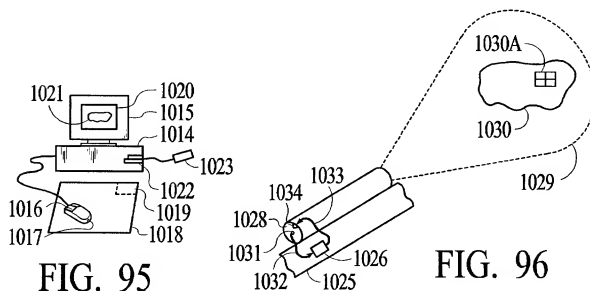


FIG. 95

FIG. 96

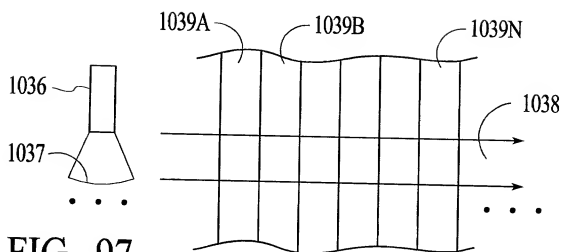


FIG. 97

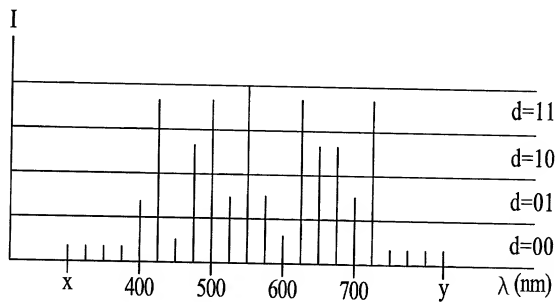


FIG. 98

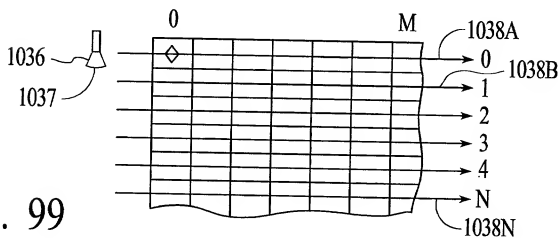


FIG. 99